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Engineering News-Record

Plan for Fall and Winter!

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• • • Development of plans for public works and their advance without delay to the working stage offers the only dependable prospect for reasonably maintained earning power.

• • • No one can now foresee the coming winter's problems, but the experience of the last one may nevertheless be taken as a warning. Work was not ready but often had to be made. We should not have to rely on similar devices again. We need not if planning is taken in hand now and an ample program for fall and winter construction laid down.

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• • • Timely planning is the crucial thing.

• • • Now is the time to begin.

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. . . . From an editorial printed in Engineering News-Record of June 18

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ENGINEERING NEWS-RECORD

A WEEKLY JOURNAL OF CIVIL ENGINEERING AND CONSTRUCTION PRACTICE

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F. E. Schmitt, Editor

JULY 2, 1931

✦

Development Work

CHICAGO, accustomed to preeminence in many fields, attained the distinction in making the meeting of the American Society for Testing Materials stronger and better attended than any previous meeting. Even for so active a society the size and caliber of last week's gathering was impressive and surprising; Chicago's central location and industrial strength no doubt played a part in bringing this result about. On the other hand the badly depressed condition of industry gave reason to expect not only reduced attendance but also lessened amount of research and new thought as reflected in the papers presented. That the meeting easily exceeded its predecessors in the face of unfavorable economic conditions is renewed evidence of the vitality inherent in technical development work in the field of materials. A year from now we may have to make a less favorable report, since the sharp contraction of recent months is likely to be reflected in research results by that time. But the excellence of the meeting just concluded gives hope that only minor effects of this kind will come to pass. It is important for the country as a whole that industrial development work should keep up its momentum in spite of the extensive curtailment of development and engineering staff made in the laboratories of many large industries.

A Testing Exhibit

PART of the credit for the strength of the Chicago meeting of the American Society for Testing Materials must go to the exhibit of testing equipment held in conjunction with the meeting. It was the first exhibit ever undertaken by the society, and it was an unqualified success, in respect to both interest displayed by visitors and quality of the displays. Evidently it is worth repeating, perhaps not each year but at least every two or three years. Machines, instruments and working demonstrations create animation that often remains suppressed in the languid atmosphere of convention sessions; yet it rests on the same interests and activities. Through this effect meetings and exhibits supplement each other in useful manner. Exhibits also have an important function in popularizing an art and making its methods and achievements known to the world at large. To this end it is desirable that the public be welcomed as widely as possible, rather than restricted in admission as was the case at Chicago. The art of materials investigation and control has need of such popularizing, for its essential place in modern industry is still almost unknown to the citizen at large. Admitting the public to such exhibits will serve to arouse public interest in the mechanical features of testing and indirectly in the research work that lies back of it.

Hot Cement

SOME of the thoughts and conclusions expressed at the A.S.T.M. meeting probably suffered from insufficient attention because of the week's oppressive heat. Among them, a conclusion relating to cement was particularly at a disadvantage, being put forward in the closing session, very late on a hot and tiresome evening. As it deserves wide attention we bring it to special notice here. The cement committee reported that some cement users, chiefly highway departments, are requiring that cement reach the job cool, not above 125 degrees Fahrenheit. Cement may easily be hot on delivery under present-day practice, even with long storage. Modern mill conditions tend to leave some of the kiln heat and most or all of the grinding heat in the cement, and once in the bins it has little chance to cool. This heat, however, has only slight influence on the temperature of the mixed concrete, for water temperature is the main factor here. No reason is known for believing that any effect of cement temperature may follow, other than that upon concrete temperature, and before a restriction is imposed the matter should be investigated to learn whether such reason exists. The cement committee accordingly has engaged in an investigation. It now asks that engineers who plan to use the restrictive clause suspend its application until the inquiry is completed. The request is authoritative and reasonable; compliance entails no hazard but will hasten a clarification of the matter at issue.

Dipper Dredge Progress

THE dipper dredge, like the steam shovel, is peculiarly an American development in excavating machines. It probably traces its heredity to the older land excavator. To remove the wheels and mount the shovel-operating parts on a boat was a natural thought and required only that the boat be kept fixed and stable in position, and adding movable legs to the boat provided these properties. In all functional essentials the fine piece of marine engineering and naval architecture known today as the dipper dredge and described in this issue is the 1837 steam shovel of Otis. But a century of engineering since Otis has wrought marvels in the substitution of improved power and materials and in the per-

fection of mechanical design and workmanship. The dipper dredges that are today digging our Great Lakes and ocean harbors and keeping the Panama Canal open are among the most perfect of the devices that serve construction engineering. In recording this fact and in depicting modern practice in design and structure, and particularly in the application of power to auxiliary operations, the article in this issue performs a distinctive service.

A Balanced View Needed

NO REFLECTION upon the usefulness of the operators of water-purification plants was intended by our reference to them in comment made recently upon the technical sessions of the American Water Works Association, nor was it the purpose of the note to depreciate the value of water purification. Technicians in the water-purification departments of our cities and in the laboratories of the makers of the equipment which they use have established an enviable record of efficiency and in research to advance the art. Those in charge of the destinies of our cities may well point to them with pride. But if the contemplation of their efficiency and progressiveness is permitted to obscure deficiencies in distribution system or in supply those in charge of the development of the whole system are losing perspective. Ultimately an overloaded condition of the system or a deficient supply will place a handicap upon the very men who are now the pride of their water department.

Look to Your Equipment

TWO years of slack construction and low prices have reduced construction plant below the normal. Contractors have not had the means and the urge to maintain high equipment standards. Like others, they have hoarded instead of spent. They have not been keen, as in busy years, to maintain full outfits nor quick to discard for obsolescence and replace for refinement. In brief, contracting today faces the call of construction with a plant depleted in quantity and inferior in perfection.

Natural and logical as the condition is, it should be remembered that it is one of illness and not of health. Contracting must prepare for convalescence and recovery. This means taking stock and keeping inventories up to date. Buying must await contracts for work, but foreknowledge of what to buy and readiness to order promptly will provide a running start in getting work and getting it under way.

Preparedness to buy wisely will count more largely in success when construction recovers than it ever has hitherto because in the past two years refinement in equipment has made selection more exacting and competition has whetted construction management to a keener edge. The contractor who provides equipment haphazardly faces an unpleasant experience as construction swings into a new era of progress. Engineering is looking for greater exactness in construction and contractors are learning to figure in nickels instead of in dollars; these facts demand closer evaluation of equipment and greater managing ability than have ever before been considered important. The contractor who fails in knowing his equipment deficiencies and the possibilities in equipment service (speed, durability, mobility and stamina) that the products of the manufacturer now offer is overlooking a very important factor in business success.

More Than the Figures Show

CONSTRUCTION costs are lowest since the war peak was deflated in 1921. Our cost index is at 174.37, which represents a steady month-by-month decline from 194.8 at the first of this year and 200.95 a year ago. These figures do not, however, give a true picture of the falling off in construction costs, because they do not reflect the increased efficiency of labor and management or the decrease in profits taken by contractors in order to get work. These intangibles cannot be taken off of price lists or payrolls and entered as factors in a cost index as can material prices and labor rates, but they can be estimated by comparing some recently completed jobs with similar ones of earlier date. In this way it is possible to produce a rough factor for use as a guide for those who wish to appraise the present as a time to build.

Our cost index shows a decrease of 10 per cent since January of this year and 13 per cent since a year ago. This decrease obviously does not apply to all classes of construction, for the cost index is based on general construction costs throughout the whole country. The actual decrease in cost of labor and material for any one structure will depend upon many factors. The same is even more true of the effect of increased labor productivity. It will be different for a loft building and a church, or for a factory and a concrete highway. It will often be different for two loft buildings of comparable design and construction. Further, the amount assigned to the productivity factor will vary with the experience and judgment of the estimator.

Although the productivity factor may vary widely, it is too important to be neglected by those who would build now. How much weight, then, should be assigned to it? In one authentic case of a building of a specific type built in 1926 and duplicated this year, the decrease in labor cost due to labor and management efficiency was calculated to be 40 per cent. From these and many additional data it is safe to place the productivity factor at from 20 to 30 per cent. The drop in material prices amounts to from 15 to 20 per cent and labor rates are down from 14 to 27 per cent.

Labor amounts to 60 per cent of the cost on building work and materials to 40 per cent. On highways and on some structures the proportion is reversed. Assuming a 50–50 basis for labor and materials, the total reduction in costs should range from 18 to 25 per cent.

With *actual* costs down this much while *apparent* costs are down only 10 to 15 per cent it is natural to ask whether actual costs will go still lower. Largely because this question has not been answered and possibly cannot be answered, even such a drastic cut in construction costs has had little effect in increasing the volume of construction. A year ago prominent builders were predicting that the bargains of that day would not be equaled again soon. They have been surpassed since then. Will there be greater bargains in the future? There are definite indications that there will not be.

In the first place, there is evidence that contractors' bid prices and costs, especially those of subcontractors, are one and the same set of figures. Work has been taken at no profit; in some instances at a loss. This cannot go on indefinitely. If contractors are to continue in the business they must bid at least a little above their costs until such time as normal demand permits normal profits. Closely related to this is the request of the railroad companies for a 15 per cent increase in

rates. They, as contractors for transportation, have seen the fallacy of doing work below cost. Freight charges are 25 per cent of building material costs. And finally, the strengthening of commodity prices during the past week is a strong indication that little more gain in that direction may be looked for.

Statistics, then, do not give a true picture of the present situation. They do not show the full amount to be gained by building now; they do not reflect intangible evidence of an upturn in prices. Those who hesitate to undertake new construction because cost indices still show a decline need to look beyond them for evidence of the fact that the time to build is now.

An Unprogressive Decision

REJECTION of the designed clearance height of the proposed 57th Street railway and highway bridge over the Hudson River at New York City sets back the prospects of realization of the project most seriously, as we pointed out two weeks ago. The project is by no means dead, but its difficulties are greatly increased.

In rejecting the application the Secretary of War carried out the duty laid upon him, which is to decide whether the proposed clearance height would unreasonably obstruct navigation. The decision is left to his judgment alone, for such is the administrative authority delegated to the Secretary by Congress.

The law requires of the Secretary that, like a court, he make a decision; it does not require him to state his reasons. But courts wisely follow the practice of stating their reasons, and herein lies their power and support. On even stronger grounds the same practice might be expected of administrative officials charged with judicial function. Secretary Hurley's decision gives no reasons, but is pure fiat. Since the intent of the law is constructive, not repressive, this is regrettable reticence.

More specifically, the decision adheres to the traditional policy of the War Department to make a separate rule for each bridge and avoid a statement of a generally applicable rule or principle. Like previous decisions, this one fails to give a statement of required clearance height limits for first-class waterways. It distinguishes New York above other harbors, San Francosco perhaps excepted, by declaring that no height under 200 ft. will be accepted, but it does not commit itself to this height. It makes no attempt to explain the contrast of the Hudson River limit with the 135 ft. of the Camden bridge. It does not explain why a height nearly twenty feet above the tallest steamer funnel in existence should be necessary or desirable.

Congress stated in chartering the bridge project that the clearance height should be at least that of the Brooklyn Bridge, 135 ft., but that the Secretary of War might require a greater clearance. The 200 ft. height is very far beyond the 135 ft. specified. No reasonable grounds for this great increase are given; in fact no grounds are given. But, since the War Department's actions on bridge clearances affect the distant future more than the present, the decision presumably is based on what the department foresees as to future ship heights. What are they? We look for them in vain. In fact, the tendency in recent ships such as the "Bremen," the "Europa" and the new Cunard liner is toward lower funnel heights.

We are concerned primarily not about the fortunes of this proposed Hudson River bridge but about the fact that no advance is being made toward assisting development by defining the future relations of ships, bridges and transport facilities. Far from assisting development, the War Department often seems to oppose it. A few years ago it ruled adversely on an application for a bridge at New Orleans, not because it would obstruct navigation but because the department's officers did not want a bridge built at that point; and they advanced as reason for rejecting the application that solid foundations could not be built—a matter on which they were not authorized to rule. That decision remains a shining illustration of the abuse of authority that thrives on arbitrary practices.

When the Kill van Kull bridge was authorized the department approved an arch clearance diagram—with upper corners heavily truncated. Shortly afterward it rejected a similar clearance diagram for the Catskill-Hudson bridge, though that structure would have to pass less and smaller traffic than the Kill bridge. The disharmony of the two rulings remains unexplained. We do not forget the recent letter to this journal in which General Brown, Chief of Engineers of the army, explained and defended such divergences of practice as expressing freedom of judgment. We respect the argument, but do not find it convincing. It goes too far; it could be made to justify any series of actions, however inconsistent and unfair.

We have suggested that the War Department's obligation in respect to bridge clearances is to act constructively. Was it constructive when the department delayed action half a dozen years on the prior application of the 57th Street bridge project? Was it constructive when, in the present instance, officers of the department, authorized only to pass on the clearance proposed at the location designated by Congress, sought to induce the applicant to abandon the 57th Street location, and made elaborate investigations to demonstrate the superior merits of another site? We think not.

Progress lies along a more open and clearly defined course of procedure than the War Department has yet chosen to follow. It lies in a well-studied, frank and conclusive formulation of a waterway and bridge clearance policy. Bridge development over navigable waterways should be by consistent plan.

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Engineering News was founded in 1874 by George H. Frost, as The Engineer and Surveyor, which title subsequently became The Engineer, Architect and Surveyor, then Engineering News and American Railway Journal and finally Engineering News, under the editorships of D. McN. Stauffer, A. M. Wellington and Charles Whiting Baker.

Engineering Record was established in 1877 by Henry C. Meyer as The Plumber and Sanitary Engineer. The name was subsequently changed to The Sanitary Engineer, Engineering and Building Record, and, finally, to Engineering Record. During his ownership of the paper Mr. Meyer was directly responsible for the editorial policy. John M. Goodell became editor of the paper in 1902 and was succeeded in 1913 by E. J. Mehren.

E. J. Mehren became editor of Engineering News-Record at the time of the consolidation in 1917, and was succeeded by Frank C. Wight in 1924. In July, 1928, F. E. Schmitt was appointed editor.

The editorial staff comprises:

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Business as Usual While Moving an Eight-Story Steel-Frame Building

Indianapolis telephone building shifted 52 ft. sideways and turned 90 deg.—Special steel framework transmits column loads to rollers running on a grillage of closely spaced rails—Principal moving force is from eighteen manually operated ratchet jacks

MOVING an eight-story steel-frame telephone switchboard building from one corner of a block to another without disrupting service or disturbing office routine represents a difficult operation that has recently been successfully completed by the Indiana Bell Telephone Co. in Indianapolis. In addition to a straight move of 52 ft., the building had to be turned through an angle of 90 deg. The following account presents the development of the plan and a detailed description of the unique moving operation.

The project was an outgrowth of a program inaugurated by the telephone company to enlarge its physical plant and thus provide for the increasing demands for service. It involved the development of the entire block bounded by New York, Pierson, Miami and Meridian Streets in downtown Indianapolis and required the construction of a new office building, since the existing main building would not permit adding more stories. It was desired to accomplish the development of this large plot in the most economical way and with the least disturbance to existing equipment and personnel housed in the main building and in a four-story reinforced-concrete building located on the diagonally opposite corner of the plot and known as the Lincoln-Riley building.

The officers of the telephone company who had charge of the development of the program first considered the demolition of the main building, but this involved not only the loss of the building, valued at $800,000, but the cost of replacing more than $1,000,000 worth of equipment in a new building. The cost of the two buildings and the equipment that were included in these considerations amounted to about $4,000,000. Moving the main building to the back of the plot without disrupting telephone service was recognized as an ideal solution, for it would permit the continued use of the old building and at the same time release a comparatively large area for a new building. After careful consideration and consultation with architects, engineers and moving contractors, a plan for moving the building was adopted that would place the façade then on Meridian St. facing New York St. This involved turning the building through 90 deg.

The building to be moved, as shown in the accompanying plot plan, had a frontage on Meridian St. of 101 ft. 4 in. and on New York St. of 134 ft. 9 in. Part of it is eight stories and part nine stories high. It is of steel-frame construction with terra cotta arch floors and brick walls. The building is about 25 years old and houses all the administrative offices, the toll switchboards and other toll line apparatus for long-distance service in Indianapolis.

Tests on Balls and Rollers—In planning the moving operation the method of turning the building was a most important consideration. The shortest and most economical path was determined by moving cardboard models of the building on a plan of the site. Another important consideration was the choice of shape and type of rollers and rolling surfaces to be used. Steel balls between two smooth steel surfaces, short barrel-shaped rollers threaded on rods to act as axles and straight steel rollers placed under the rolling shoes were among the suggestions made. Because of this diversity of opinion as to the merits of balls and rollers, a series of tests was carried out at Columbia University on case-hardened steel balls 2 in. in diameter and on 2-in.-diameter rollers cut from structural grade shafting.

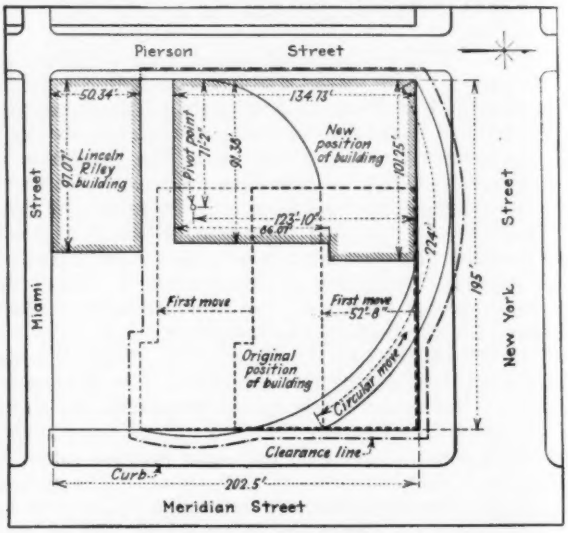


Fig. 1—**Plot plan showing path of building in moving from original to final position**

Indiana Bell Telephone Co. owns complete block and plans to build new office building on Meridian St. frontage, including plot vacated by old building.

Fig. 3 shows the arrangement of the balls (rollers were similar in the testing machine) and the apparatus used for determining the horizontal force necessary to move them under various vertical loads. The balls and rollers were kept in position by means of races or perforated metal plates. Five different arrangements of balls and rollers were tested, with the results shown in Fig. 3.

The plates used were of structural grade steel and, compared with the balls, were very soft. Under load the balls had a tendency to cut grooves in the plate, which increased the horizontal force necessary to move them. With harder plates the grooving effect was reduced but not sufficiently to warrant the extra cost that the use of

hardened plates would involve. It was concluded that the parallel rollers were the most satisfactory, as the percentage of horizontal force required to move a given vertical load was by far the smallest. It was also concluded that it would probably be easier to guide a building on rollers than on balls.

Adopted Plan—It was recommended, therefore, that steel rollers be used, the rolling surfaces to be flat plates supported on steel rails or beams resting on steel or wood ties. The ties were to be carried on a 6-in. concrete mat laid directly on the soil. All columns were to be braced laterally to prevent twisting or displacement. Brackets riveted to the columns were proposed as jacking points when lifting the building and also as supports for the structure during the moving operation. Two or more rolling surfaces or "shoes" were recommended for use at each column.

It was agreed that the shortest and most economical path of the building would be as shown in Fig. 1. This was made up, first, of a straight move of about 52 ft. directly south from New York St., bringing the rear wall of the building within a few feet of the north wall of the Lincoln-Riley Building; and second, of a rotary motion of 90 deg. about a pivot point selected so that the building would be brought into its exact final position at the corner of New York and Pierson Streets. This plan required the building to be lifted but once, for the purpose of changing the alignment for the rollers and shoes from a straight to a circular motion.

Foundations—The main office building was originally supported on concrete spread footings bearing at 4 tons per sq.ft. on a coarse uniform sand formation of great depth in which the groundwater plane was considerably below the subgrade level of the construction. The weight of the building and its contents was 11,000 tons, so that the distribution of load to the soil during the moving operation was approximately 1 ton per sq.ft., a negligible load so far as settlement was concerned.

The first steps in the preparation of the site for the moving operation included the wrecking of the other buildings on the site, with the exception of the Lincoln-Riley Building, excavation of all materials within the "clearance lines" to 21 in. below the finished basement floor and the construction of the new foundation of the building over the area of its new location. A working

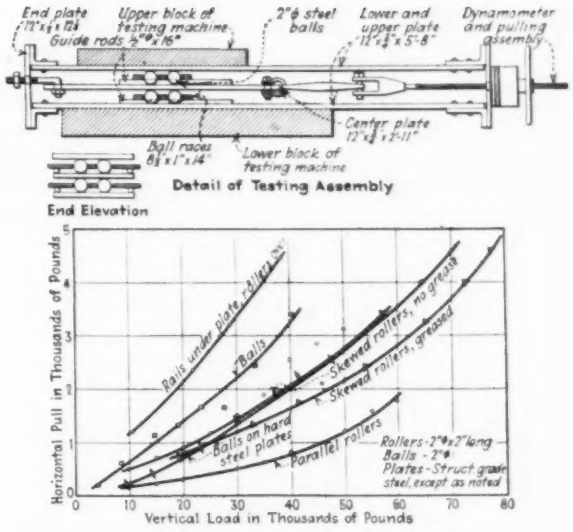


Fig. 3—Set-up for testing efficiencies of rolling surfaces, together with test results

mat of reinforced concrete, 6 in. thick, was then placed over the entire area to be traversed by the building during the moving operation.

The 13½-ft. street banks left by the excavation were retained partly by the original gravity retaining walls of the sidewalk vault and partly by deep-arch-web steel sheeting driven to stand by cantilever action, so that no bracing, to interfere with the moving operations, would be required.

In the original basement of the building was a 56x60-ft. boiler and machinery room and three elevator pits, the floors of which were more than 10 ft. below the top of the working mat. A series of 10-in. concrete walls was built on 7-ft. centers across these pits, and the spaces between were filled with well-compacted sand to support the working mat, which over this area was made 13 in. thick and designed for 3,200 lb. per sq.ft. The concrete working mat over the elevator pits in the new basement area was supported by 12x12-in. timbers set on end. The Lincoln-Riley Building was underpinned along its north and east sides with a continuous concrete wall.

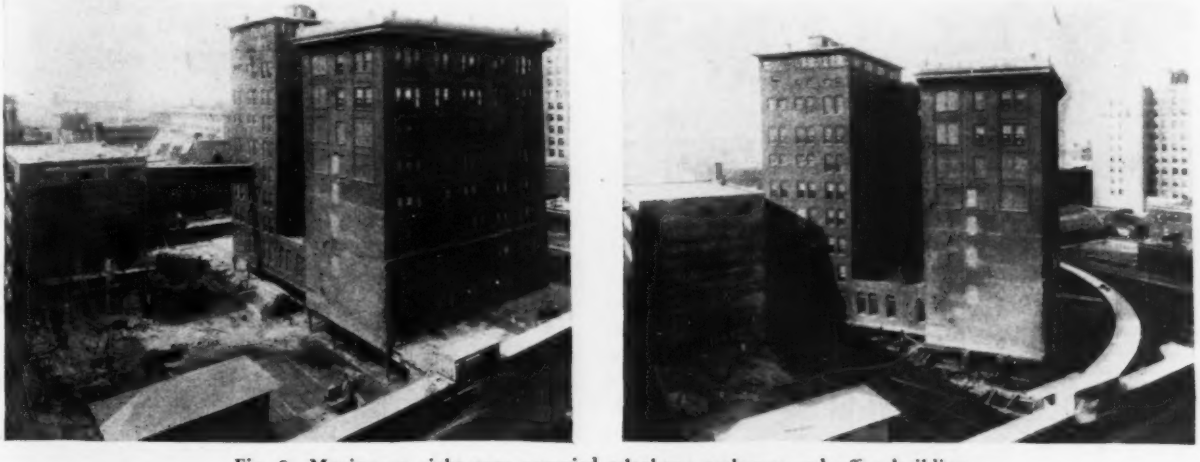


Fig. 2—Moving an eight-story occupied telephone exchange and office building

View at left shows original position with basement story exposed ready for temporary steel supports and rollers. In view at right, building has been partly turned in its 90 deg. path. Note sidewalk bridge connecting to front entrance and in foreground flexible conduits carrying telephone trunk lines.

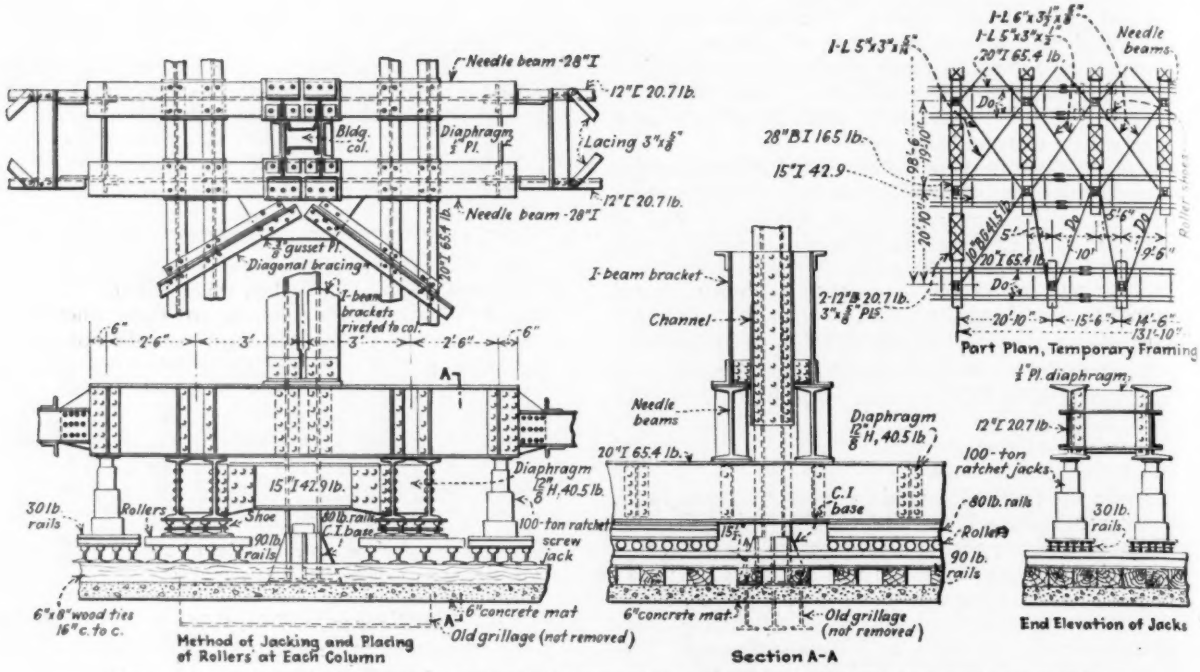


Fig. 4—Plan and details of temporary steelwork for supporting and bracing building during moving operation

Foundation consists of a 6-in. concrete slab over whole area, with wood ties and a grillage of rails. Old column loads were transferred to temporary steelwork by jacks shown.

Extreme care was taken during the construction of the 6-in. working mat to finish the top to an accurate level. On top of the working mat and covering the entire area to be occupied by the moving operations was placed a system of 6x8-in. timbers laid flat on 16-in. centers, the ends of the timbers being lapped at the butts. Immediately on these timbers was laid a system of 85-lb. T-rails, spaced 9 in. on centers.

The rails were arranged in radial formation to parallel so far as possible the direction of movement of the building, and in no case at an angle greater than 45 deg. from the position of the overlying rollers. The careful workmanship that these preparations entailed was well repaid, for the moving forces were much smaller than those ordinarily required in operations of this kind.

Structural Features—Final plans for the additional steelwork and alterations for supporting and stiffening the building during the moving operations were developed on the basis of using four rolling surfaces at each column, instead of the two originally planned, a change made at the request of the moving contractor. Fig. 4 is a plan of the new steelwork and shows the general arrangement of brackets, girders and transverse bracing. Pairs of I-beam sections were placed vertically with their webs riveted to the column flanges to take the entire column load. The bottom ends of these I-beam brackets were milled to bear over the webs of pairs of needle beams, which in turn were supported on two pairs of 20-in. I-beam girders extending continuously in the east and west direction of the building. The needle beams were extended far enough beyond the 20-in. girder beams to accommodate a pair of jacks at each end. Diaphragms were bolted between the webs of each pair of needle beams at the jacking points; and stiffeners, milled to bear against the lower flange, were used over the supporting 20-in. I-beam girders. Between the ends of the needle beams under adjacent columns, pairs of 12-in. channels, laced top and bottom, were used to stiffen the entire structure in a north and south direction. Diagonal cross-bracing composed of single and double angles, was used in each panel to equalize the lateral strains and to prevent lateral distortion of the building and columns. Because the columns in the north line were spaced differently from those in the remainder of the building, the bracing in the bay adjacent to the north face was made up of stiff members that could take either compression or tension.

It was estimated, for the purpose of design, that a total lateral force of 300 to 400 tons would be required to move the building, but the actual moving force proved to be considerably less. From the leverage required to actuate the jacks it was estimated that the moving force was approximately 1½ to 2 per cent of the vertical load.

The work of preparing the site was begun about the middle of the summer of 1930, and by the latter part of September the building was ready to be raised enough to remove the cast-iron column bases and install the shoes and rollers. The relative levels of the supporting steel frame and the top of the rails were such that it was necessary to raise the building only ⅛ to ¼ in. in order to transfer the load from bases to rollers. The raising was accomplished with ratchet screw-jacks of 100-tons capacity each. As it was not practicable to raise the entire building in one operation, on account of the number of jacks and men required, it was done by progressively raising four to six columns at a time. A few small plaster cracks developed in various parts of the building, but none was of a serious nature and many of them closed up again as soon as the lifting operation was completed.

Moving—The first move of the building (52 ft. in a straight line southward) was begun on Oct. 14 and completed in four days. Eighteen 100-ton ratchet screw-jacks were distributed along the north face of the building (Fig. 5), so arranged that a uniform lateral force could be applied at all points; this amounted to 10 or

12 tons for each jack. The jacks used had a maximum stroke of 12 in. In order to keep the pressure and movement as nearly uniform as possible, the men operating the jacks were instructed to take a given number of strokes with the operating lever (usually about six) at the sound of a whistle blown by the foreman of the gang, and then to rest until the next signal. This procedure worked very satisfactorily. As soon as the jacks were fully extended they were reset for another "throw." A gang of men was assigned to watch and reset the rollers as the building moved forward.

In making the second or circular movement it was required to lift the building and readjust the rollers and rolling shoes. This was accomplished in five days. The circular movement (224 ft. on the arc) was begun on Oct. 23 and completed in seventeen days. The pivot point was accurately fixed and marked on the track work, and a corresponding point, located directly over it, was marked in the building; a plumb-bob, suspended from the building structure, assisted in checking the vertical alignment of these two points. Any tendency to shift out of position was corrected by "cutting" the rollers—that is, slightly changing the direction with a sledge hammer. For the purpose of aligning the rollers, which had to be placed radially in order to make the circular move, radial white lines intersecting at the pivot point were painted on top of the rails. The men looking after the rollers would sight along one or more of these lines and thus gage the correct direction of the rollers. Remarkably accurate results were obtained by this method.

In addition to the pivot point and the radial lines, lines describing the path of the two corners of the north face of the building were computed and marked on the rails, and pointers rigged up exactly under the corners indicated any slight variation in the true course of the building. These lines were particularly essential for the final 15 or 20 ft. of the move, as the pivot point would not register small variations with a sufficient degree of accuracy. Throughout the entire circular move the variation from the true course did not exceed 1 or 2 in., and for the last 20 ft. the maximum variation was only about $\frac{1}{4}$ in. The building was brought into final position to within $\frac{1}{16}$ in. of its figured location.

The moving force for the circular move was furnished partly by jacks placed along the east end of the rear wall and partly by a steam donkey engine from which two sets of six-part blocks and $\frac{3}{4}$-in. cable leads were attached to the steelwork supporting the building. Thus, with a pull of 5 or 6 tons on each lead line at the donkey engine drums a pull of 60 to 72 tons was put on each set of tackle, which helped materially to reduce the labor necessary to operate the jacks and also speeded up the moving. The cable-pulling arrangement may be seen in Fig. 7.

Landing the Building—Landing the building on its new foundation was accomplished by jacking up five or six columns at a time, sufficiently to replace the rollers and shoes with the original cast-iron pedestals. The work was done progressively so as not to cause unnecessary strains in the structure. Each base was bolted

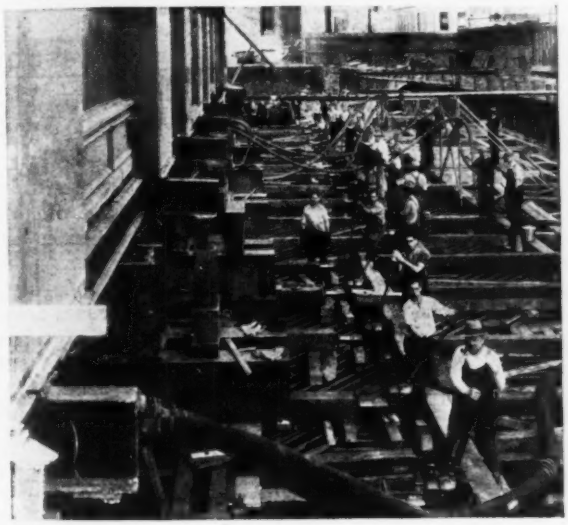
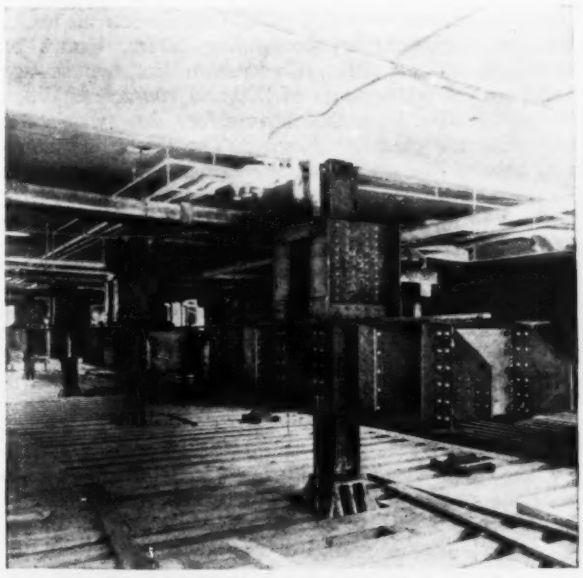


Fig. 5—Eighteen manually operated ratchet jacks provided the moving force



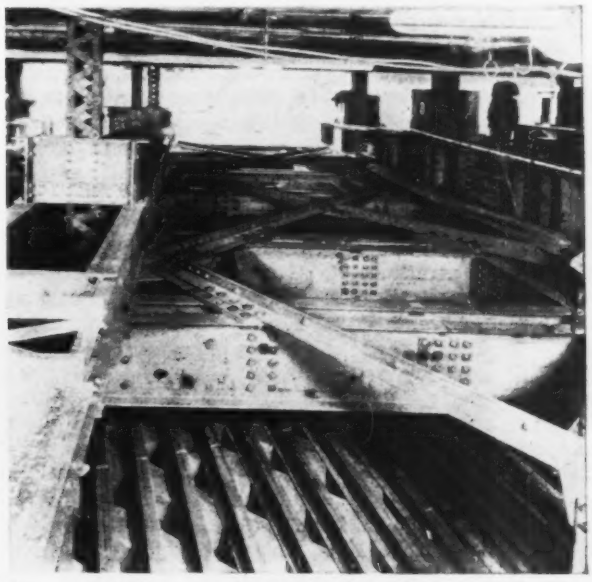


Fig. 6—Old building columns connected to temporary framework that supported building during moving

At left, needle beams have been attached to old columns, and remainder of steelwork is incomplete. Right view shows completed temporary supports and bracing.

Fig. 7—Water, sewage, gas, steam and telephone connections to building were maintained by use of flexible hose

Note wire-rope pulling rig, which is attached to a steam donkey engine (not visible); this supplemented the force applied by the ratchet jacks on the circular move of building.

tightly to the bottom of the column, and cement grout was poured between the under side of the base and the top of the foundation to insure firm bearing. Quick-setting cement was used, so that the jacks could be released as soon as possible and used for another group of columns. The rails and ties were removed as the rollers were taken out, and the temporary steelwork followed as the landing of the building progressed. The concrete mat under the building was left in place, but the remainder will be removed with the excavation for the new building.

Maintenance of Telephone Equipment—The structure except for the basement, continued to be fully occupied, and business was conducted with the public as usual and with normal operation of all house services and telephone equipment. To avoid any interruption of telephone service, the wires were lengthened where they left the building by splicing in place temporarily seven large armored submarine-type cables with 200 ft. of slack. These cables were pulled along as the building moved. Gas, water, sewer and steam-heat services were maintained without interruption through the use of flexible hose connections installed in multiple with bypass valves, so that the hose might be lengthened or shortened without interruption of service. Electric service was maintained through aerial leads of sufficient length to accommodate the movement of the building.

Elevator sevice was continued by stopping cars at the first floor instead of traveling to the basement, as was the normal arrangement. Necessary safety apparatus was installed on the steel framework and traveled with the building.

To maintain connection between the main entrance and the sidewalk, a movable bridge was constructed, one end resting on the floor of the building vestibule and the other supported by steel framework, which in turn was supported by rollers traveling over the same steel rails that carried the building. During the turning movement a steel and concrete curved temporary walk was used to maintain connection with this bridge. The easy motion of the building could not be felt by the occupants and was imperceptible to the casual observer.

Administration and Personnel—The members of the Indiana Bell Telephone Co. organization that developed the plans for the building program were F. A. Montrose, vice-president and general manager; Vance Oathout, chief engineer; and E. B. Webb, building and equipment engineer. They were assisted in their investigations by Vonnegut, Bohn & Mueller, architects of Indianapolis. S. F. Voorhees, of Voorhees, Gmelin & Walker, New York, consulting architects for the American Telephone & Telegraph Co., reviewed the problem and encouraged the plan to move the building. Two firms of consulting engineers from New York, Moran & Proctor, and H. G. Balcom, were retained to pass on the feasibility and safety of the operation and to design the foundations and necessary structural layout. Leslie Colvin, Indianapolis, was the general contractor, and the actual moving of the building was carried out by John Eichleay, Jr., Co., Pittsburgh, Pa. Maintenance of mechanical and electrical service during moving was in charge of Bevington-Williams, Inc., consulting engineers, Indianapolis.

Sixteen Years' Operation of Cheltenham Sewage-Works

SLUDGE from the settling tanks of the sewage-works of Cheltenham, England, has been utilized on privately owned farm land for the sixteen years since the works were put into operation. The borough pumps the sludge for the farmers, delivering it as a rule into lagoons formed by throwing up embankments of fine ashes from the municipal refuse destructor. After the sludge has drained it is thrown from the lagoons onto heaps, from which the farmers cart it away to their land. Occasionally, according to an article on the Cheltenham sewage-works by J. S. Pickering, borough engineer, in the London *Surveyor* (May 22, 1931, p. 559), the liquid sludge is delivered direct to the land for irrigation. The sludge is used on both pasture and arable land and also on market gardens. Mr. Pickering states that for a period of fifteen years no sludge has accumulated at the works.

Besides treatment works, which include detritus tanks, primary settling tanks, percolating filters, humus or secondary settling tanks, Cheltenham has two sewage farms with irrigable areas of 200 and 130 acres. When the works were built the dry-weather flow was about 2,400,000 gal. (U.S. standard). The intention was to treat half of this sewage on the farms and half of it in the tanks and on the filters. Land treatment at the larger of the two farms proved to be so unreliable that the tanks and filters were extended to have a capacity of 2.1 m.g.d. of dry-weather sewage and three times that volume in wet weather. Leaving the larger farms to take charge of stormflow in excess of three and up to six times the dry-weather flow. The remaining 0.3 m.g.d. is treated by broad irrigation at the smaller farm.

Until two years ago both the sewage farms were operated by the borough, "and, like most farms used for sewage disposal, showed an appreciable annual loss on working expenses, in addition to the charges on capital." For the past two years the farms have been leased at an annual rental of £526, or about $2,500 a year. Against this revenue the borough provides labor for distributing the sludge for irrigation, and keeps up the carriers and the drainage system at a cost of about £280, or $1,360 a year.

The entire capital cost of the sewage-works is some £64,000, or $310,000. The works serve a population of about 55,000, including Charlton Kings as well as Cheltenham.

The annual cost of sewage disposal, including not merely working expenses but capital and other charges, is as follows:

SEWAGE WORKS		
Loans, rates, taxes and insurance	$20,011	
Working expenses	6,818	
	$26,829	
Less contribution from Charlton Kings and rural district council	5,795	$21,034
SEWAGE FARMS		
Loans, rates, taxes and insurance	$4,821	
Repairs, etc.	487	
Irrigation, drainage, etc.	877	
	$6,185	
Less rent	2,562	3,623
Total cost		$24,657

To prevent trouble from the occasional heavy discharge of waste from the gas-works into the sewerage system, an arrangement has been made with the gas company by means of which the wastes are stored in underground reservoirs and pumped to a tank and discharged from the latter through a V-notch into the sewer at a rate not to exceed 5 per cent of the average dry-weather flow of sewage.

New Permeability Specimen for Comparison Tests

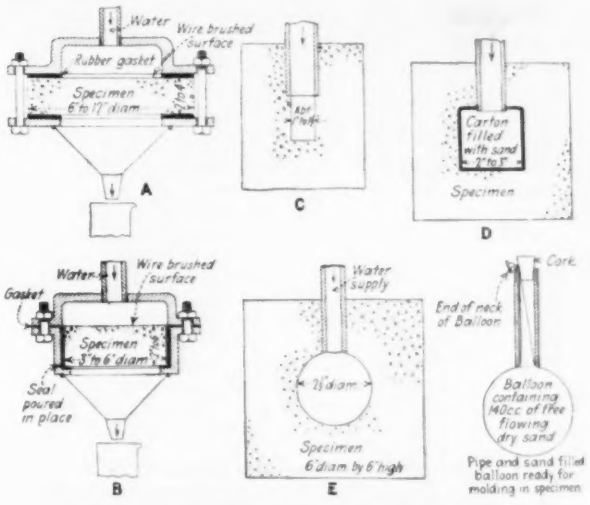
By CLOYD M. CHAPMAN
Consulting Engineer, New York

TO AVOID the shortcomings of test specimens now used for rating the permeability of concrete, I have developed a new form of specimen that combines the advantages of cheapness, ease of molding and testing, and uniformity. It is sketched herewith in comparison with those now most used.

Every laboratory has a different specimen and test method, but the disk specimen with exposed outer surface (sketch *A*) is most common. Leakage through the periphery makes the test less uniform and simple than it appears; it is a costly test because of the holders, and often the specimen breaks because of clamping strains. Disk or cylinder specimens sealed in an inclosing shell by rosin, wax or asphalt (*B*) are less popular and have some of the same disadvantages.

Bomb-type specimens consist of a block having an internal pressure cavity formed either by a removable plug projecting through the supply pipe (sketch *C*) or by a cardboard box left in place (*D*). In such specimens the surface exposed to water pressure is of variable size and texture, but the simplicity and cheapness of the test commend it. For this reason the author's specimen is of the bomb type, with cavity formed by a process that eliminates the disadvantages mentioned.

The specimen is molded around a long-necked toy balloon filled with exactly 140 c.c. of fine free-flowing dry sand, the filling being conveniently accomplished by blowing the sand through a container made by soldering together the large ends of two 2½-in. aluminum funnels, readily obtainable everywhere. When the balloon is filled with the measured quantity of sand and is manipulated into substantially spherical form, it has a diameter of 2½ in. and a surface area of just 20 sq.in. The neck is then drawn through the inlet pipe and the specimen is molded around pipe and balloon. A specimen of 6-in. outer diameter and 6 in. high is convenient. The inlet pipe may be coated with neat cement to insure a tight seal, and the mold should be rodded or vibrated while filling, first to the height of the bottom of the bag and then the rest of the way. After the specimen is hardened the sand is emptied from the bag and bag is withdrawn.



Permeability specimens in use and proposed

Two forms of disk specimen shown at *A* and *B*, with bare outer surface, and sealed into an inclosing shell with rosin, wax and asphalt. Bomb specimens, *C* and *D*, are cheaper and simpler, but the cavity is likely to be variable in size and surface condition, whether formed by a plug of wood or metal projecting from the supply pipe (*C*) or by a porous carton left in place (*D*). The new specimen now proposed (*E*) is of the bomb type with spherical cavity of definitely known area formed by a long-necked balloon filled with a known volume of sand. Washing out the cavity with acid before the test avoids error due to surface film.

Then the cement skin is removed from the surface of the cavity by washing it out with dilute hydrochloric acid and rinsing out with water.

With a cylindrical specimen having a spherical cavity the thickness of concrete through which the water is to pass is not the same in all directions, but this is not important, because permeability tests are comparative rather than absolute.

Dependable comparisons are obtained provided successive specimens are of the same dimensions.

How to Receive Sunday Visitors at a Sewage Plant

A schedule for the reception of visitors at the Aurora (Ill.) sewage-treatment works includes the following items, W. A. Sperry, superintendent, told the Central States Sewage Association at Madison, Wis., recently: A road sign on the highway at the main entrance; a group of exhibits planned to explain and instruct; a series of framed statements placed around the plant explaining the function of each element; appropriate labels on doors; a neat suit for Sunday wear by plant operator; a souvenir leaflet describing the plant; and walks for easy access to the river where visitors may see the final results accomplished by the plant.

Heavy Building Underpinning, Nassau-Broad St. Subway

Success of open-cut method of construction through quicksand area of lower Manhattan depended upon providing proper support for adjacent buildings — 4,800-ft. double-track route cost more than $10,000,000

By W. T. McINTOSH
Engineer, Spencer, White & Prentis, Inc., New York

THE OPENING of the Nassau-Broad St. subway on May 30 marked the completion of the most expensive and one of the most difficult sections of the New York subway system. This double-track line, 4,820 ft. long, cost $10,072,000. The new subway is not a part of the independent system now being built by the city, but is the final work under a contract made eighteen years ago between the city and the New York Municipal Railway Corp., now the Brooklyn-Manhattan Transit Co., one of the two companies operating the city subways. Construction was delayed largely because of the difficulties and risk involved in underpinning the heavy buildings along the route. Contracts were finally awarded in 1927, the work being divided into two sections, both to be built by the open-cut method. Strenuous objection at once arose to this type of construction because of possible danger to the adjacent buildings, as the subway cut would be much deeper than many of the building foundations, few of which went down to rock. Shield tunnels were proposed instead of the open cut, but after formal hearings the contracts were confirmed and work was started early in 1928. The underpinning methods used on the north section were described in *Engineering News-Record* June 27, 1929, p. 1018. The following article describes methods of underpinning used on the south section. —EDITOR.

Fig. 1—Underpinning system on National Bank of Commerce Building

THE south section of the Nassau-Broad St. subway, extending from Liberty St. to South St., 2,630 ft., is a two-track structure, except at the south end, between Beaver and Front Sts., where the line branches into four tracks. The two outside tracks dip down into rock tunnels at the south end to connect with the existing river tunnels, and the two middle tracks, used for turnback service, stub-end near Water St. The subway trench varies from 25 to 50 ft. deep and requires the underpinning of all buildings along Broad St. that were not already founded on rock.

A total of 39 buildings were supported, some of them twenty stories high. Many of the buildings had extremely heavy wall and column loads. In all, 3,840 lin.ft. of buildings was underpinned, with 363 steel pipe piles having a total length of 12,500 ft. For the most part the piles were 16 in. but some 12-in. and 14-in. piles were used. An innovation in pipe pile underpinning was the use of 36-in. open caissons, large enough to permit a man to work within. Other types of underpinning were used at the south end, where the hardpan level rose nearer the street and the subway trench lies deep in the hardpan, or even in rock.

The National Bank of Commerce Building, at the corner of Nassau and Cedar Sts., was one of the heaviest to be undeprinned. It is twenty stories high, with column loads in the front wall running up to 788 tons. It is one of the oldest steel skeleton buildings in New York, and rests on spread footings on quicksand. Hardpan is 46 ft. below, and subgrade for the subway structure is 24 ft. below the footings.

The building was underpinned with 16-in. steel pipe piles jacked down to hardpan by the pre-test method. Eight columns along Nassau St. were carried by spread footings, extending beyond the building line (Fig. 1) and even beyond the net line of the subway wall. This necessitated installing the underpinning well back under the footings in order that the projecting portions might be removed.

Work was begun by digging an approach pit (No. 1 on Fig. 3) to a depth of 5 ft. below one of the footings. The pit was extended under the footing exposing only 4 sq.ft., to undermine as small an area as possible. A 16-in. steel pipe pile was then set up and jacked down in the usual manner. This pile was installed in 3-ft. lengths joined with internal cast-iron sleeves. Jacking was done

Fig. 2—Two rows of underpinning, National Bank of Commerce Building

Supporting columns wedged between tops of piles and bottom of footings have been painted with hot tar. Tops of pile cylinders have been incased in concrete slab.

with a 4½-in. ram, hydraulic pressure being supplied by a central pump, automatically controlled by a hydro-pneumatic accumulator. As the pile was jacked down it was excavated with a water jet and pump suction, great care being taken to keep the jet well above the bottom of the pile to prevent scouring underneath. When the pile was seated on hardpan, it was pumped out and concreted.

After the concrete had set, the pile designed to carry 65 tons, was tested to 100 tons by two rams reacting against the footing. While the full test pressure was maintained, the pile was wedged securely against the footing.

Simultaneously, pits Nos. 2 and 3 were opened and piles installed in them in the same manner. The three pits were located at widely separated points so as not unnecessarily to reduce the bearing capacity of the footings at any one point. When piles had been completed in these pits, adding 360 tons to the carrying capacity of the footings, three more pits, Nos. 4, 5 and 6, were opened up. These were in front of the projecting footings, and it was necessary to drift in from 5 to 10 ft. to the location of the front row of piles. Not unduly to weaken the footings in this drifting process, temporary piles were installed in the drifts. These were jacked, tested and wedged in the same manner as the permanent piles. After these had been installed, pits Nos. 7 and 8 were opened and additional temporary piles installed.

It was then possible to work on all eight locations at the same time. Each pit was enlarged just enough to permit the installation of another pile, the piles being located 3 ft. center to center each way. A total of 95 cylinders from 45 to 50 ft. long was installed. Beginning at the north end of the building and working south, the piles were then tested and wedged in groups of three to overcome the effect of the capacity of one pile being reduced by the installation of a pile next to it. The bottom 2 ft. of the pits was then concreted, embedding the tops of all underpinning cylinders in continuous concrete slab 2 ft. thick and 8 ft. wide, leaving the wedging beams exposed to permit rewedging if necessary. These wedging beams were covered with hot tar to prevent corrosion (Fig. 2).

The settlement of the building during underpinning was very slight and so gradual that no damage was done. The underpinning operations were conducted from outside the building, under the sidewalk, without interference to the occupants of the building or to traffic on the sidewalk or street.

New Method with 36-in. Caissons

At the Wall Street Journal Building, 44 Broad St., the new open caisson method of underpinning was used. This method is essentially the same as for steel piles, except that the cylinders are large enough to permit men working inside to do the excavating and to remove obstructions. The building, eight stories high, with front wall column loads of 135 to 175 tons, was built on wood

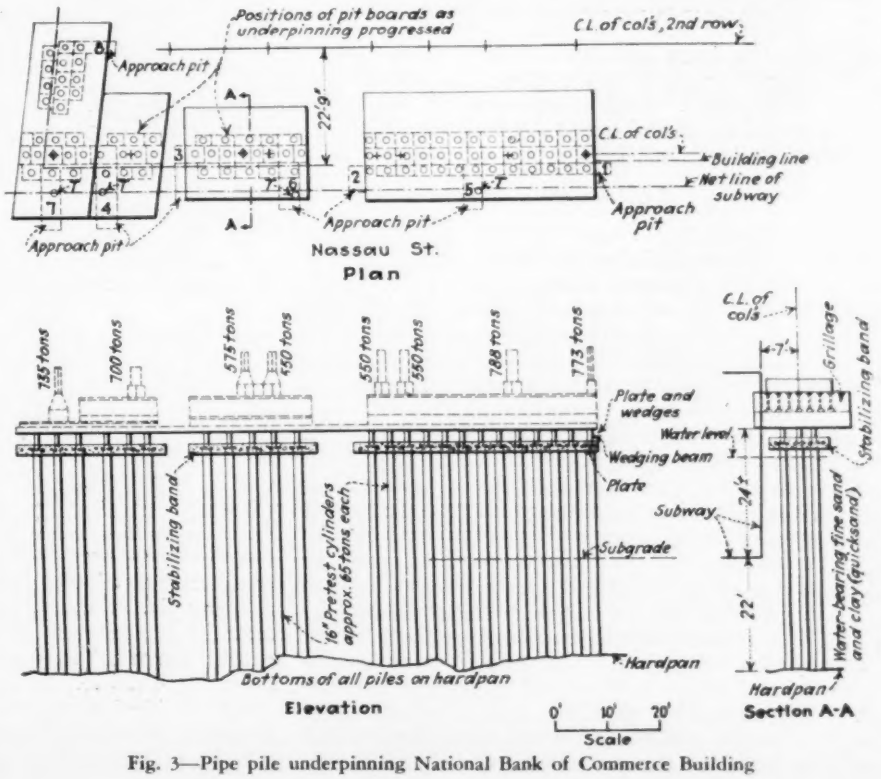


Fig. 3—Pipe pile underpinning National Bank of Commerce Building

piles driven to hardpan, 30 ft. below the footings. Doubtless the piles when driven were below the groundwater level, but subsequent excavations and drainage had in 1928 lowered the water level to 3 ft. below the footings. As a result of this the tops of the piles were badly rotted.

The old piles were out of plumb and jammed close together, making it impossible to jack regulation underpinning piles between them. The fine quicksand prevented the sinking of sheeted pits. Steel cylinders 36 in. in diameter were jacked down in sections 2 ft. long and were excavated by men working inside. Muck was

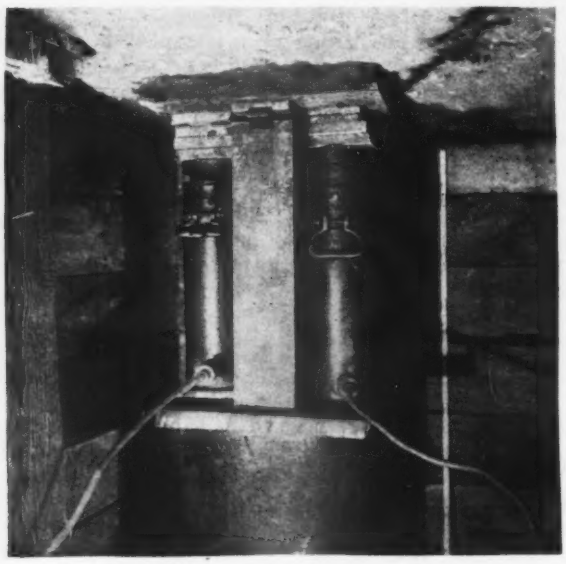


Fig. 4—Testing and wedging a steel pipe pile

The test pressure is held on the two hydraulic jacks while the wedges are driven above the I-section column.

shoveled into caisson buckets and hoisted to the surface. Wood piles encountered as the caisson went down were cut out of the way. After being seated in hardpan the caissons were tested and wedged at loads of 190 to 285 tons each.

Pit Underpinning

Pit underpinning was used for the ten-story Metropolitan Telephone Building, at Broad and Pearl Sts. Each of its eight columns along the front carries 250 tons. The building rested on a heavy concrete mat, with about 30 wood piles under each column. The mat rested on a compact water-bearing mixture of fine sand and clay 15 ft. deep, below which is a layer of hardpan 14 ft. thick, underlain by rock.

Subgrade for the new subway was almost at rock line, which necessitated carrying the underpinning through the hardpan to rock. It was not considered safe to dig beneath the columns without temporarily underpinning them because of possible weakening of the wood piles by previous lowering of groundwater level. Temporary 16-in. steel piles were installed under the mat between columns, jacked down to hardpan, tested and wedged.

Pits, 4 ft. square, were then sunk under the columns, the wood piles being chopped out as they were encountered. The pits were lined with 2-in. horizontal sheeting. This method of sheeting, usual in dry ground, proved to be very difficult in the wet clay and sand, and was complicated by the presence of the old piles. In one pit a 36-in. steel cylinder caisson had to be used because of the volume of water encountered. When the pits reached rock they were concreted, wedged and drypacked against the footings. The settlement was negligible and the building was not damaged by the operation.

At 77-79 Broad St. the grillage and pit method of underpinning was used. The material was a fine sand and clay to a depth of 15 ft. below footings, then a 7-ft. layer of hardpan to rock. The subway grade was below top of rock, making it advisable to underpin to rock rather than to jack-piles to hardpan. The building column loads were light.

A continuous grillage was installed the full length of the building front. Below this grillage three underpinning pits were sunk to support the seven building columns. The method of constructing the grillage was to install transverse I-beams, notched into the masonry columns just above their footings, together with heavy steel dowels into the columns. Below the transverse beams were placed longitudinal I-beams on each side of the footings, tied together by cables, and the whole incased in concrete. These grillages bound the footings securely together and acted as a continuous beam to transmit the column loads to the underpinning piers, which were sunk by the pit method.

Organization

The subway line was built for the New York board of transportation. Robert Ridgway is chief engineer of the board and John R. Slattery is deputy chief engineer in charge of construction. The north section was built by Marcus Contracting Co., Inc., with Spencer, White & Prentis, Inc., managing engineer. The south section was built by Moranti & Raymond, Inc., with Spencer, White & Prentis, Inc., as subcontractor on the underpinning work.

Pavement Cores Stronger than Test Cylinders

Recent data on concrete pavement cores and test cylinders obtained in the department of public works of Allegheny County (Pittsburgh) add valuable confirmation to prior experience showing excess of core strength over test cylinder strength. A large series of test cylinders (28-day strength) on both pavement base and concrete road mixture show an average value of 2,957 lb. per sq.in. Cores of 6 in. diameter drilled from the same bases and roads at ages of five to seven months showed compressive strength (corrected to 12-in. length) averaging 4,856 lb. per sq.in. The accompanying table gives individual group results. The data are from P. J. Freeman, chief engineer of tests and specifications, Allegheny County.

6-IN. CORES, AGE 5 TO 7 MONTHS		TEST CYLINDERS, 6x12 In.*	
No. of Specimens	Lb. Per Sq. In.	No. of Specimens	Lb. Per Sq. In.
21	4,654	204	2,538
7	4,741	221	2,122
14	5,090	21	3,053
16	4,296	29	3,170
5	4,998	16	2,768
5	4,284	12	2,445
8	5,175	27	2,458
4	3,265	60	2,250
8	5,041	38	3,321
4	5,824	10	3,084
6	4,885	11	3,955
6	6,017	28	4,320
.. Average	4,856	... Average	2,957

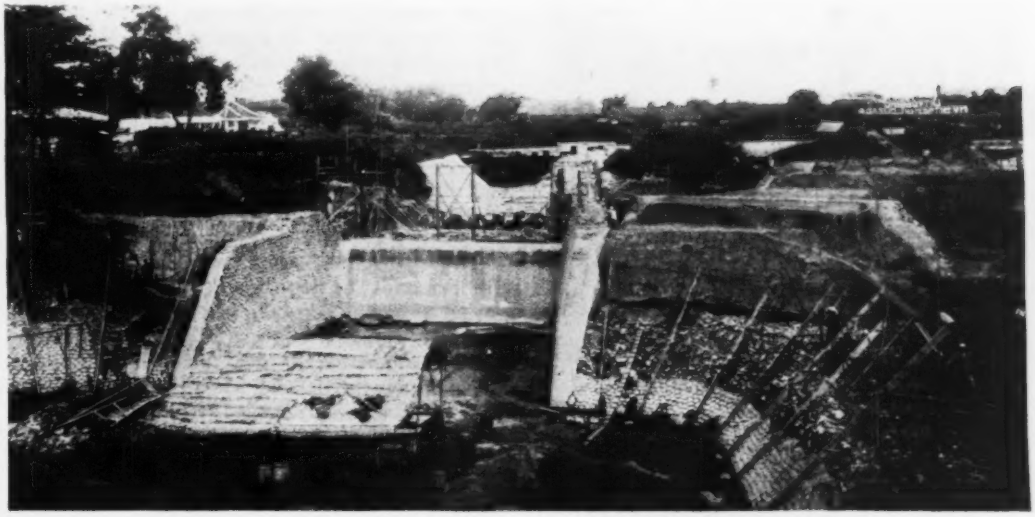


Fig. 1—Construction of dam and locks on the Sourabaya River at Sourabaya

Irrigation in Java

By HAROLD E. BABBITT
Professor of Sanitary Engineering, University of Illinois, Urbana, Ill.

JAVA is one of the most thickly settled countries in the world, with a population of 36,403,883 in 1925. This population, in an area about equal to that of New York State, gives an average density of 1.12 persons per acre and about two per acre in the most thickly settled agricultural districts. The pursuits of the population are almost entirely agricultural, the two most important crops being rice and sugar. Other crops that require irrigation include peanuts, tapioca, corn, cassava, potatoes, soya beans and tobacco. Of the land under cultivation for all purposes, 40 per cent is devoted to rice and about 10 per cent to sugar. Almost 90 per cent of the rice land is irrigated. In spite of the relatively large area devoted to rice, enough is not grown and additional rice must be imported. Sugar is the most valuable export crop and is essential to the country's prosperity.

The population of Java is increasing at a rate of about 12 per cent per decade, and this, added to the fact that the food supply is insufficient, forces the government to increase the area of irrigated rice land. As the country is completely settled, no new land can be opened to cultivation. Irrigation of rice fields has been practiced since ancient times, but there is still a large area of unirrigated land which may be made available for rice and sugar cane. Rapid progress is being made in extending irrigation works, but much work is yet to be done.

All irrigation works are under the control of the bureau of irrigation of the department of public works. For administrative purposes Java is divided into five districts, as shown in Fig. 2, known as West Java, Middle Java, East Java, the Sultanate of Djokjakarta and the Susuhunanate of Soerakarta. The irrigation works in the three larger divisions are administered by division engineers who are responsible to the chief engineer in Batavia. New projects are usually reported upon by the

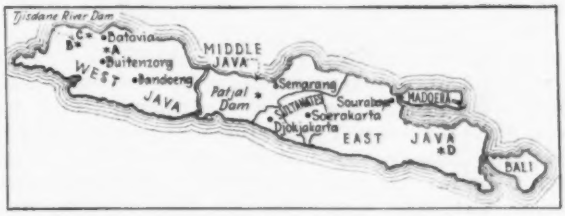


Fig. 2—Irrigation projects in Java

A—Krawang project; *B*, Bantam project; *C*, West Batavia project; *D*, East Java project.

division engineer, whose plans, estimates and recommendations are transmitted through the proper channels to the director of public works and then to the governor-general. Upon approval by the governor-general and the council, provision is made for the payment of all costs from funds received from general taxation, not from special levies or rentals from the benefited areas. This policy of the government is based on the principle that food is essential to the country's welfare and that its production must be encouraged. Some return from the funds invested in irrigation works is obtained through taxes on the increased crops from the irrigated areas.

Ownership of the land remains principally in native hands. Large holdings by Dutch or foreign capital are not permitted. Since certain crops, particularly sugar, cannot be raised profitably on small holdings, concessions are granted by the government to private foreign capital to rent a limited area of land from the native owners for a period of eighteen months. At the end of this time the land must be returned to the owners and by them devoted to the cultivation of rice.

Only the government can acquire ownership to large tracts of land. This right is exercised in acquiring lands for irrigation works. The cost of such works usually

Fig. 3—Terraced rice fields in Bali

Fig. 4—Unique excavation procedure on Tjisadane River dam in which the excavated material is carried off in the stream

is between $30 and $40 per acre. Although the construction of works is more expensive in rough topography than in flat districts, the drainage works required in the latter make the cost independent of the topography. The government usually constructs the entire irrigation works except for the terracing of the fields and those minor irrigation channels which place the water directly upon the land. Terracing of the fields is done by the natives, the location and leveling of the embankment being determined by eye. Sometimes this work is of great magnitude, and the appearance of a large terraced valley with steep hillsides studded with palms is one of the principal charms of the Javanese landscape. Construction of the minor irrigation channels, which distribute the water directly to the land, is done by volunteer unpaid native labor with direction from government engineers.

In Java the rate of rainfall varies with the locality. The highest average annual rainfall, 273 in., occurred at Tombo, in West Java, at an elevation of 2,360 ft., and the lowest, 36 in., was recorded at Asembagoes, near the east coast. The highest rainfall recorded in 24 hours occurred in Kranggan, in Middle Java, at an elevation of 1,020 ft. and amounted to 13 in. The rate of evaporation usually estimated in the design of irrigation works is 30 in. per year, allowing $\frac{1}{4}$ in. per day during the dry season. Almost all the rain falls between October and May. It is usually precipitated at a high rate for a short period, which results in large fluctuations of flow in the streams and requires special precautions in the construction of river-control and irrigation works.

The capacity of irrigation works is fixed primarily by the demands during the dry months. The growing period of rice is six to eight months, during four or five of which water is required. In growing rice it is necessary to submerge the field under 3 to 6 in. of water, allowing between 10 and 13 gal. per minute of water per acre of rice land during the growing period of five months, depending on the rainfall, character of the soil and other conditions. This is more than double the amount of water required by sugar cane and far more than is required by any other crop. Sugar cane requires irrigation only during the dry season. Rice is usually cultivated only during the dry season, hence the water demands of the two crops do not interfere. As a rule the water demands of rice are the standard for which irrigation works are designed. The growing period of sugar cane is about eighteen months, during the first six of which the ordinary rainfall furnishes insufficient water. The rice fields are usually inundated during the entire period of growth.

In the construction of irrigation works, both contract and day labor systems are used. The latter is preferred by the irrigation engineers, as it is felt that better and more economical results are obtained. Labor is plentiful during the dry season, when conditions are most suitable for construction, and it is slightly less plentiful during the wet season, when there are greater agricultural activities. Much labor is required to prepare the land for the planting of sugar cane and for planting and harvesting rice. The pay of labor is low, the minimum wage for the coolie, or common laborer, varying between 12c. and 16c. per day, the higher rate being paid in or near centers of population. Women may receive slightly more than half of this wage and may be used for breaking rock, carrying loads or other tasks requiring a minimum of skill. Skilled labor, such as carpenters, masons and machinists, may receive 50c. per day. The period of labor varies between 8 and 9½ hours per day for six days per week. The native Javanese, although neither strong nor ambitious, is an industrious and faithful laborer. He possesses good intelligence and is capable of being trained to have excellent mechanical skill and efficiency. The higher technical positions only are filled by Dutch engineers. No labor is imported.

Fig. 5—The Tjisadane River Dam

Construction methods are markedly different from those in the United States, owing to the cheapness and availability of labor. The smallest possible amount of mechanical equipment is employed, and primitive methods are sometimes used. Construction work presents a scene of concentrated activity, the job being covered with busy laborers. An example of this is illustrated by Fig. 4, which shows a method of earth excavation in which the material is removed by throwing it into a stream of water admitted through a hole in the protecting dike, the silt-bearing water then being pumped back into the river.

Irrigation works in Java may be divided into three general types: (1) Works depending upon impounding or storage reservoirs; (2) works securing water through river diversion; (3) works securing water by pumping from rivers or drainage channels. The primary irrigation of land is almost always attained by gravity distribution of the water. Most of the large irrigation works, especially those located at the higher elevations, depend upon works of the first type, as the flow of the streams may cease during the dry season. All of the larger projects now under construction are of this type. The construction of works for the utilization of water by pumping is more often done by private interests.

Fig. 6—Sketch of site of Tjisadane River dam

At the time of my visit to Java (in March, 1930) there were 42 irrigation projects under construction, involving an expenditure of more than $40,000,000, of which about $3,500,000 was to be spent last year. The projects listed in the accompanying table were among the largest on which work was being done.

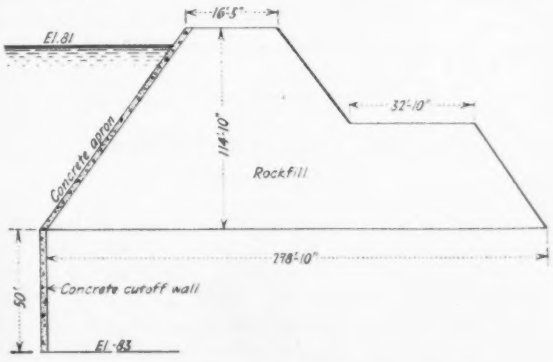


Fig. 7—Dimensions of Patjal River dam

Among the largest structures being erected are the Tjisadane River dam, the Patjal River dam and the Sourabaya River dam and locks. The bureau of irrigation is also charged with the construction of flood-control and river-control works, and in this connection an extensive project for the improvement of the Sourabaya River through Sourabaya is now under way at an estimated cost of $720,000. The Tjisadane River dam, illustrated in Fig. 5, is being constructed in an oxbow bend in the river, somewhat as shown in Fig. 6. Completion of the dam without interruption of the natural flow of the river is permitted by its location. Upon completion of the dam and control works, the river will be directed through the control works and its original bed will be filled with

LARGE IRRIGATION PROJECTS UNDER CONSTRUCTION IN JAVA

Name	Location on Fig. 2	Estimated Total Cost in Gold Dollars
Krawang or Tardem River	A	8,000,000
Bantam	B	4,400,000
West Batavia or Tangerang	C	4,000,000
East Java (Bondojedo-en Tanggoelriveren	D	3,200,000
Tjipoenajara	..	2,400,000
West Tjimanoekbevloeung	..	960,000

an earth embankment at *B* in Fig. 6. It is expected that much of the river between the dam and point *B* will be rapidly silted up because of the large amount of silt carried by the river. This dam will form a reservoir holding enough water to irrigate 52,500 acres of rice land. It is of the gravity type, built of rubble masonry, with foundations constructed on the "hydraulic gradient" principle because of the poor substrata. The width of the structure across the stream is 402 ft., its length in a direction parallel to the flow of the stream is 295 ft. and the greatest depth of water behind the dam is 30 ft. There are ten control gates, similar to stoney gates, eight of them 32 ft. 10 in. wide by 23 ft. 9 in. high. These ten gates are capable of passing the full flow of the river. The dam is built on a porous foundation with long upstream and downstream aprons, the length of the aprons being so designed that the assumed hydraulic grade line of flow beneath the dam will intersect the surface of the river at low water at or above the flow of the dam. The thickness of the apron is designed to give sufficient weight to exceed the upward water pressure. In such designs the downstream apron is made ten to fifteen times as long as the depth of water above the dam. It is expected that this dam will cost between $600,000 and $800,000.

Rubble masonry is used in many irrigation structures because it is less costly than other material available. Concrete can be made stronger, but since rubble masonry is satisfactory in mass structures and is cheaper, its use is general. A small amount of portland cement concrete is used. In the Tjisadane River dam concrete has been used in the lower parts of the upstream and downstream aprons to support the vertical metal guides for the control gates and other necessary points. The cement used for concrete or mortar may be portland or natural cement, or equal parts of lime and burned clay. The last is used extensively because of its availability, satisfaction and low price.

An interesting example of the construction of a rockfill dam on a porous foundation is provided in the Patjal River dam. The general dimensions of the principal cross-section are given in Fig. 7. The width of the valley at the top of the dam is 360 ft. and the structure will contain 104,000 cu.yd. of material. The reservoir formed will hold 13 billion gal. and will have a drainage area of 32½ square miles. The lake will have a surface area of 1,235 acres and the area to be irrigated is 35,000 acres. It is estimated that the cost of the dam alone will be $480,000.

The Patjal River dam is located in a narrow opening between hills, which are widely separated just above the dam. The dam site is formed of alternate strata of shattered, clayey marl and shattered limestone, each stratum being about 6 ft. thick and lying at an angle of about 10 deg. from the vertical in a plane transverse to the direction of the flow of the river. Water acts as a lubricant in the clayey marl and the limestone is shattered into pieces smaller than the hand. The pieces lie so loosely together that they can be removed with little effort, and the porosity of such material is high. Imperviousness in the foundation has been obtained by

Fig. 8—Patjal River Dam looking upstream

Fig. 9—A small canal with trapezoidal weir

covering the bottom and side slopes with a layer of impervious rubble masonry connected to a concrete cutoff wall penetrating to a depth of about 50 ft.

Construction of the cutoff wall presented great difficulties, the procedure followed being to construct a line of bore holes from 6 to 10 ft. on each side of the center line of the cutoff wall. The bore was first driven to a depth of about 6 ft. and cement grout was forced into it at a pressure of one to two atmospheres until no more grout was absorbed at this pressure. After the grout had been allowed to set for 48 hours, a water pressure test was made on the hole. If water could be forced into the hole at a relatively low pressure faster than 1½ gal. per minute, more grout was forced in at a slightly higher pressure. Grouting at slightly increased pressure was alternated with water tests until the hole would take water at less than the limit of rate. The hole was then driven an additional 6 ft. and the process was repeated until the desired depth was reached. When each line of holes had been completed, the cutoff trench was excavated and was found to be practically dry. The trench was then filled with concrete to form the cutoff wall. Attempts to force the grout into either deep or shallow holes at high pressures up to 450 lb. per sq.in. proved unsuccessful in securing imperviousness, as the high pressure served only to open cracks in the shattered limestone. The amount of material in the dam has been made large in order to increase the resistance to sliding on the wet clay strata. Great care must be exercised to secure stability in the dam because of the probable disastrous effects resulting from its failure. The rocks forming the fill are carefully fitted by hand to form a dry masonry.

The dam and locks in the Sourabaya River, illustrated in Fig. 1, will cost $560,000. There will be two locks 25x135 ft., with a depth of 29½ ft. and a lift of 16 ft., and two sluices with 18-ft. openings capable of passing 5,600 sec.-ft. Maximum flow of the river is about 20,000 sec.-ft.

No construction work was in progress in Middle Java at the time of my visit. Plans had been prepared for two projects on which it was expected to start construction in 1931. These are the Gembong project and the Dongos project, costing $248,000 and $128,000 respectively. The former will involve the construction of an earth dam 100 ft. high by 1,640 ft. long, containing 288,000 cu.yd. of material and irrigating 25,000 acres of land. The Dongos project will require the construction of a hydraulic-fill earth dam 64 ft. high by 540 ft. long, containing 238,000 cu.yd. of material. This project will irrigate 8,200 acres of land.

An experimental hydraulic laboratory is maintained by the bureau of irrigation in Semarang for the purpose of testing various control and measuring devices, channels, etc. In the design of channels, Bazin's formula with its original coefficient is used. Refinement is considered unnecessary, and a large factor of safety is used because of the uncertainty concerning the silting of the channel, growths, etc. Velocities in unlined earth channels are usually restricted to less than 1½ to 3 ft. per second.

The unvarying success of the irrigation works constructed by the Dutch and the permanency of the structures erected by them under difficult conditions are a tribute to their ability, thoroughness and foresight. Extra care is taken to obtain successful projects and stable structures, not only because of the possible loss of life and damage to property, but because of the loss of prestige to Dutch engineering in the minds of the natives in the event of failure. The infallability of the Dutch engineers in the minds of the natives is conducive to success and to tranquility in government.

Auxiliary Trucks Carry Wrecker While Traveling

Distribution of load over additional axles during transportation is a curious feature of a railway wrecking crane recently built in England. The steam revolving crane is mounted on a heavy frame 25 ft. long carried by four rigid axles. But beyond each end is a six-wheel 11-ton truck 15 ft. long, the end sills of the main frame and truck frames engaging with relieving girders in such a way as to transfer a large proportion of the weight from the main axles to the truck axles. Thus the load on the main axles when the crane is at work is 144 tons, or an average of 36 tons per axle; but with the trucks attached for transportation this load is only 68 tons, or 17 tons per axle, while the loads on the truck axles are 13 to 16 tons. When the machine reaches its working place, the end trucks are detached and the crane removes them from the track. The crane has a plate-girder boom with hoisting capacity of 105 tons at 20 ft. radius and 45 tons at 30-ft. radius. Outrigger I-beams are operated by rack gearing and fitted with screwjacks. As arranged for transportation the machine with its auxiliary trucks and a four-wheel car supporting the end of the boom, has an over-all length of 70 ft. and a total weight of 177 tons. In this wrecking crane, built by the Ransomes & Rapier Co., the relieving trucks are of the Stokes patented system.

Modern Heavy-Service Dipper-Dredge Design

Hull, spud and crane structure and steam, diesel and electric power plants are products of the most advanced marine engineering practice

By O. P. ERICKSON
Engineer, Great Lakes Dredge & Dock Company, Chicago, Ill.

THE MODERN dipper dredge is as great an advance over the earlier machines of Osgood as is the modern battleship over the ironclads of the civil war. The origin is uncertain but is commonly attributed to the steam shovel built by Otis in 1837. Colonel Craighill in his report on rivers and harbors for 1847 mentions dipper dredges. Osgood, who later became one of the notable dredge builders of America came out with his improved dredge in 1878 or 1879. Dipper dredges had become common in the eighties; one of these machines, illustrated by Vernon Harcourt in his treatise on rivers and harbors, is shown by one of the accompanying sketches, another of which shows the early dredge of Osgood, and a third a still older dredge.

Illustration of these early dredges is important only in contrast with modern heavy-service dredges, the development of which dates from about 1900. In 1903 Osgood built the first 15-yd. dipper dredge capable of digging to a depth of 50 ft. Soon afterwards dredge manufacturers were building 10- to 15-yd. dredges generally for use on the Great Lakes and the Panama Canal.

General Dredge Practice

The notable improvements in dipper dredges have been: (1) steel construction, (2) wire-rope hoisting cables, (3) spiral winding drums, (4) power dipper trip, (5) boom-thrust machinery, (6) stern spud-walking machinery, and (7) diesel-electric power plants.

Dredge Sizes—The size of a dipper dredge is usually defined by its largest dipper. The capacity varies with the size of the dipper, the speed of the operating cycle and the hoisting cable pull. Sizes range from small 1-yd. dippers to dippers of 16-cu.yd. capacity. The operating cycle for the 6- to 12-yd. machine, which is perhaps the size most used, lies between 40 to 60 sec. in a water depth of 30 to 40 ft. The 10- to 16-yd. dippers have an operating cycle varying between 45 to 90 sec. in a water depth of 40 to 50 ft. The hoisting cable pull on the 6- to 12-yd. dippers varies from 125,000 to 250,000 lb., and on the 10- to 16-yd. dippers from 200,000 to 350,000 lb. The horsepower of the 6- to 12-yd. machines varies between 400 and 1,100, and for the 10- to 16-yd. machines from 600 to 1,500.

Hull Construction—Dipper-dredge hulls usually have square ends with the corners rounded to a 3- to 5-ft. radius. Generally dredges of over 6-cu.yd. capacity have steel hulls. The older dredges had longitudinal and cross-trusses built into the hull with few, if any, watertight bulkheads; later-day dredges have, besides trusses, a number of watertight bulkheads. Besides adding strength the bulkheads lower the insurance rates, as they are safeguards against sinking from collision with passing craft when operating, or from foundering when caught in a storm at sea during tow from one job to another. The crew's quarters are usually built on top of the main deck house on the modern dredge.

Power Plant—Steam power plant seems to be preferred to the diesel-electric power plant by the majority of contractors. The main reasons are the smaller first cost and the greater simplicity of the steam engine. In favor of the diesel-electric dredges, however, are reduced fuel and water costs, flexibility of operation and elimination of firemen and boiler delays. On the electric dredges direct current with Ward-Leonard control is usually employed. Notable steam-dipper dredges in the 10- to 15-yd. class are the "Cascades," "Paraiso" and "Gamboa" on the Canal Zone, and the "Toledo" of the Breyman Co. Diesel-electric dipper dredges are the 12- to 16-yd. "Crest" and the 8- to 12-yd. "Mogul" of the Great Lakes Dredge & Dock Co.

Boom and Dipper Construction

The booms in most common use are the curved-top-and-bottom-chord type and the box-girder straight-taper type. The curved-top-and-bottom-chord type is used by the U. S. government on the above mentioned dredges in the Canal Zone and on the 10-yd. dredges "Majestic" and "No. 9" of the Great Lakes Dredge & Dock Co. With this type of boom the swing circle or turn table is usually located on top of the main deck house and connected structurally to the boom near the shipper shaft.

The box-girder straight-taper type of boom is used on the 16- and 12-yd. diesel-electric dredges "Crest" and "Mogul," and on the 10-yd. steam dredges "Gov. Herrick" and "Warfield" of the Arundel Corp. The boom gradually increases in depth from the boom point, sheaves downward, so that the bottom chord of the boom connects with the front of the swing circle and the top chord with the rear. This makes a very rigid and substantial method of fastening the swing circle to the boom; it also lowers the center of gravity of the boom and places the swing circle on the main deck, both of which increase the stability of the dredge over the first described arrangement. With both types of boom the boom heel and castings are stepped into a cast-steel pivot bearing which rotates on a cast-steel base plate flanged over the front edge of the hull. Particular care is taken to obtain positive lubrication between the base plate and pivot bearing. This type of boom lends itself well to the installation of the boom-thrust machinery now coming into general use, because of the added control it gives over the dipper.

It is good practice to provide two locations on the boom for the shipper shaft, so that for shallow digging the shipper shaft and dipper arm can be moved 5 to 8 ft. farther up on the boom. The dipper arm most used today is the rack-and-pinion type, the dipper cable passing through a slot in the dipper arm. On the later

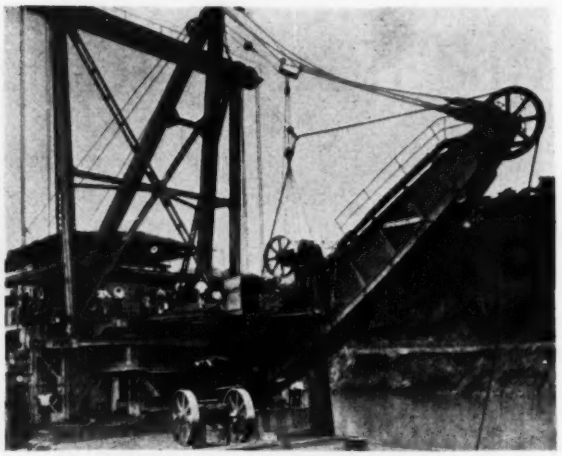
large dredges with powerful hoisting machinery two dipper hoisting cables are used, one cable passing on each side of the dipper arm. The tension in the two cables is equalized by suitable means. By using two cables instead of one, smaller diameter cables can be used. Careful design of the dipper arm, shipper shaft, pinions and rack are important, as experience has shown that these parts give trouble in various ways, especially if the dredge has boom-thrust machinery. An auxiliary stone hoist is installed on some of the latter dredges on the upper end of boom for the purpose of removing large rocks from the dipper, the usual capacity of these being 10 to 20 tons.

The dipper is the most important part of the dredge equipment, particularly the rock dipper. With few exceptions rock dippers are now made of alloy steel. The mud dipper is made of cast steel, steel plate and sometimes of alloy steel. The large dippers are now often cast in two sections with flanges for bolting the parts together. In such cases the bowl section may be of cast steel and the lip section of alloy steel. As the dipper lip usually wears out or breaks before the bowl, this permits the replacement of the lip at a fraction of the cost of a whole dipper. Teeth with or without renewable special alloy-steel points are used on all rock dippers. A great deal of study and experiment has been put on dippers and dipper teeth by steel-casting and alloy-steel organizations, but there is still room for improvement, particularly in tooth points that will stand up when digging rock. Under severe rock digging, tooth points wear out and have to be replaced every 24 hours.

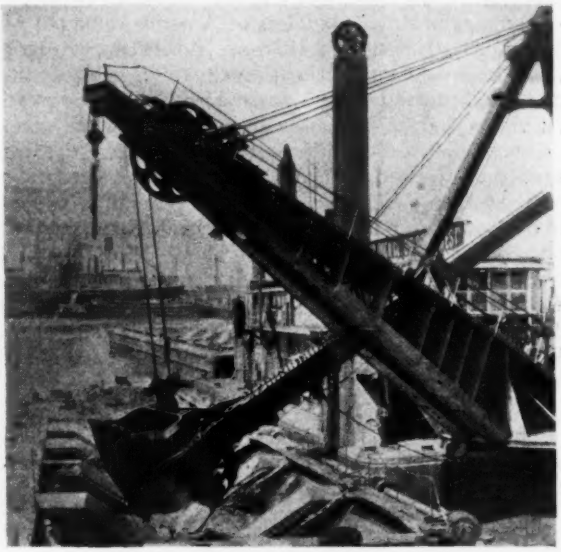
Spud Construction and Appurtenances

The spuds for dipper dredges are square and with few exceptions are of steel. On most modern dredges the hoisting cable sheaves are near the lower end of the spud, thereby eliminating the high gallows frame required when the sheaves are on top of the spud. It is good practice to locate the lower sheaves so that they will come above the deck for inspection or removal when the spud is hoisted to its highest position. Sheaves for the "pinning-up" cables are located on top of the spuds, and some of the larger dredges use a four-part pin-up cable to take the tremendous loads on the cables which must be added to a pin-up load of 100,000 to 200,000 lb. when digging over the side or swinging the loaded dipper over the scow. The construction usually consists of heavy corner angles, side plates and diaphragms spaced every 10 to 15 ft. Additional reinforcing of the heaviest stressed sections in the form of channels, Z-bars or lattice-truss girder construction is used on some of the larger dredges.

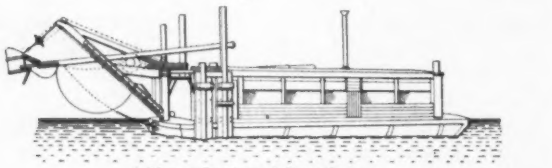
Alloy steel is now used for spud points on many dredges, as it has been found that with ordinary cast steel the point wears off quickly under severe pinning-up conditions on hard rock bottom. Experience has shown that spud points have a tendency to work loose on the spud, therefore this detail is given especial consideration when designing spuds. Spud feet are used on most dredges in soft digging. Ordinarily the spuds are unshipped when installing or removing the feet. Recently, however, a new type of foot has been developed that can be installed and removed without unshipping the spuds. The stern spud is usually considerably smaller than the forward spuds, and on some of the modern dredges it is equipped with walking machinery whereby the forward movement of the dredge is assisted. All the larger dredges now admit the spuds



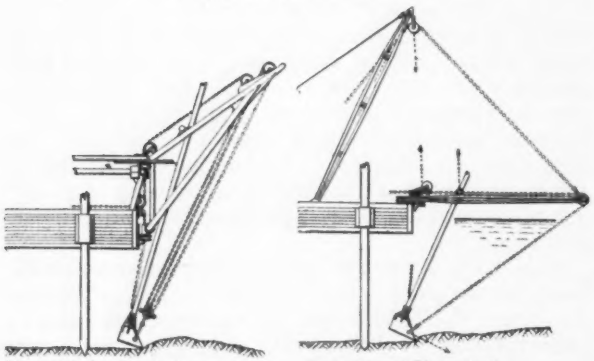
Curved-bottom-and-top boom for 15-yd. dredge



Straight taper boom for 16-yd. dredge



A Dipper Dredge of the 80's



Dredge Used in New York Harbor in 70's — Early Osgood Dipper Dredge

Some primitive dipper dredges

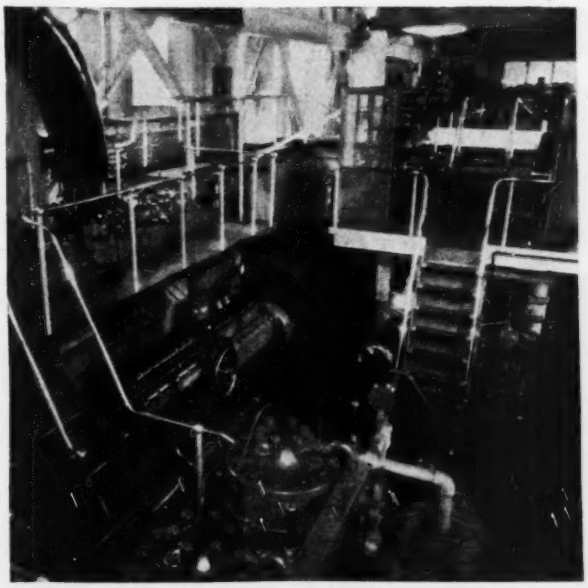
through gates into the spud wells instead of lifting them into a built-in spud well. The gate type of well permits the removal of a bent spud that otherwise would cause serious delay and perhaps damage to the dredge. The spuds on almost all the later dredges are located 15 to 18 ft. back from the bow of the hull, or so that the boom can swing through 180 or 90 deg. on each side of the dredge. This permits better loading of the scows than when the spuds are located at the corners of the hull.

Dredge-Operating Machinery

All important hoisting drums are now made of alloy steel instead of the cast steel and cast iron used in the old days. Engine and drum-bed plates and side frames are steel castings. The main-hoist drum is always of the differential type on all larger dredges. Dredges using twin dipper cables have the larger diameter of the drum in the middle. On the larger dredges the drum is usually driven by two gears, one on each side meshing with corresponding pinions on the intermediate shaft. The intermediate shaft is driven by the engine crankshaft on steam dredges. On the diesel-electric dredges the drum is usually driven through intermediate shafts and pinions by two motors.

The horsepower of the main hoist and the other operating engines varies greatly according to the individual contractor's viewpoint. But the most up-to-date steam and electric dredges of the 6- to 12-yd. size have between 200 and 400 hp., and the 10- to 16-yd. dippers between 300 and 600 hp. on the main hoist. On some of the larger dredges a main-hoisting cable-tension indicator reading the cable pull direct is installed. This indicator is particularly valuable in rock-digging on dredges with high cable pull, as the operator can, by means of it, prevent dangerous overloading of the hoist cables.

The horsepower in per cent of the main-hoist horsepower of the various operating engines or motors on the later dredges and some of the improvements of these units are as follows: The backing drum in the old days was driven from the main-hoist drum gears but is now with few exceptions operated by a separate engine or motor rated at about 16 per cent of the main-hoist horsepower. The swing drum is driven through gearing by a reversible engine or motor rated at about 20 per cent of the main-hoist horsepower. The forward spuds on the older dredges were handled by separate engines or from the main hoist, but on modern dredges the spud drums are operated through gearing by one reversible engine or motor rated at about 20 per cent of the main-hoist horsepower. Boom-thrust machinery is operated through gearing by a reversible engine or motor rated at about 19 per cent of the main-hoist horsepower. The stern-spud hoisting drum is operated through gearing by an engine or motor rated at about 16 per cent of the main-hoist horsepower. A stern-spud walking arrangement for assisting in moving the dredge ahead is used on some of the best-equipped dredges and is operated by a motor rated at about 2.5 per cent of the main-hoist horsepower. All large dredges now use deck winches for the quick handling of the dump scows, one winch on each side of dredge driven by an engine or motor rated at about 7 per cent of the main-hoist horsepower. These winches usually have three drums each.



Engine room of diesel-electric dredge

Dump-Scow Construction

The dump scow is to the dipper dredge what the floating pontoon line and shoreline are to the hydraulic dredge. The hydraulic dredge pumps material through pipe lines to the disposal station. The dipper dredge loads the material into scows, which are towed to the disposal station and dumped there. The hydraulic dredge can pump through a maximum of 3 miles of pipe line under favorable conditions. The dipper-dredge dump scows are often towed 30 miles or more to a disposal station.

Scows like dredges have grown in size during the last years. Dump scows are now usually built of steel with carrying capacities of from 500 to 3,000 cu.yd. The 750- to 1,500-yd. capacity scows are most used by the average contractor. They permit of easy handling in close quarters with the dredge deck engines and are large enough for economical towing to distant disposal grounds. Scows over 1,000-cu.yd. capacity with few exceptions are now equipped with power-operated winding gear for closing the hopper doors. Steam, diesel or gas engines are the types of power used. Usually the steam is supplied to the scow engine from the tug. With either type of engine there is a large speed reduction between engine and hopper winding drum or shaft; 10 hp. is about the average for the steam-driven operating gear and about 4 hp. for the diesel or gas-engine operated winding gear. Wire rope instead of chains has lately come into use on the larger scows for holding the hopper doors closed and has given entire satisfaction.

Dump scows with shaped or rounded ends are coming into use. The shaped end offers much less resistance to towing than the square ends and permits the use of a lower-powered tug for handling the tow, or more scows with shaped ends can be handled than scows with square ends with the same tug power. Depressed hopper division bulkheads are now used on some of the later scows. This allows quicker loading by the dipper dredge and is of especial advantage when loading the scows with a hydraulic dredge discharge, as the depressed bulkheads permit the pumped mixture to flow to all the hoppers at once. For towing the scows to and from the disposal areas steam and diesel tugs are used ranging from 250 to 1,200 hp., depending on the length of tow, number of scows per tow, etc.

Expert Testimony on

Wind Design for Tall Buildings—V

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Some Problems of the Future

IN THIS concluding article of the series on wind design, a half-dozen structural engineers add brief statements of views to those already expressed in the preceding four articles. Some of the new aspects of the wind-design problem that have been touched upon by these discussions are the variation of wind pressure with height, the importance of vibration resistance, the necessity for experimental study of actual buildings, the fact that the massive column sections of tall buildings are the governing element in the design, since all floor and bracing steel must be adjusted to their rigidities, and finally the importance of connection details in assuring the rigidity for which the frame has been proportioned. Wind design is entering a phase of active study that holds much promise. These discussions should be the introduction to much more complete publication of views and data. When the rebuilding of our cities is resumed after the current lull in activity, there will be need for more definite information on wind design than has ever before been available. —EDITOR.

A Veteran's Views

IN GIVING consideration to the new problems that have come to the front in this present era of super-skyscrapers the writer naturally turned first to what has been written regarding wind stresses. He has long sponsored, though he did not originate, the "cantilever" and the "portal" methods of determining wind stresses in a many-storied building. Notwithstanding much adverse and some deserved criticism, he still thinks that for the average office building and the conditions under which it is designed the structural engineer is obliged to choose one of the these methods. They have been followed in hundreds of buildings without a single recorded case of disaster. Other methods have been proposed from time to time, but they have not been used to any appreciable extent.

Both the cantilever and the portal methods have their limitations. The "World Almanac" for 1931 lists 30 buildings in New York City 40 or more stories in height, many of which are tower buildings. In these super-tall structures deflection and vibration often need to be considered as well as strength. The same may be said of all buildings with a great ratio of height to base; that is, similar problems are involved in a building 350 ft. high and with a 45-ft. base, now being erected, as in a 1,000-ft. tower with a base of 150 ft.

Mr. Coyle's article (*ENR*, Feb. 19, 1931, p. 310) is to the point in stating that additional observations of the behavior of buildings are required. Just how these will be obtained is not clear. Owners object to observations being taken, the results of which may possibly lessen their rental receipts. Incidentally, observations have been promised that have not materialized. An exception is taken to Mr. Coyle's statement: "The absolute value of the wind pressure is important only for checking our present practice with regard to stability against overturning." The strength of windbracing is measured by the intensity of the wind pressure it is capable of resisting. No analysis is complete that does not consider strength as well as rigidity.

The staff article in this same issue, "Wind Design for 1,000-Ft. Tower Buildings," is an excellent review of the present situation. The basis of wind design in the Empire State Building and the Manhattan Co. Building are given—probably for the first time in print. It is interesting to note that the method used in the Empire State Building by the engineer, H. G. Balcom, is an evolution worked out progressively from practice on earlier very high buildings. Probably no engineer has had more wind-design experience than Mr. Balcom, and it would be no small contribution to engineering if he would give in detail his methods and conclusions. The layout of the Manhattan Co. Building was quite complicated. The engineer, Henry V. Spurr, in designing the windbracing, followed the method presented in his book, "Wind Bracing—the Importance of Rigidity in High Towers," which, incidentally, is a valuable addition to the literature of the subject. The method proposed is not easy of application, but "there is no royal road to learning." Neither is there a short and easy method of designing for deflection and vibration. Fortunately, it is necessary only in exceptional cases to consider these factors. The conventional methods will not be abandoned. More attention, however, should be paid to details. The stiffness of a steel frame depends largely upon its connections.

ROBINS FLEMING,
New York City. *American Bridge Co.*

Pressure Variation With Height

ENGINEERING KNOWLEDGE is based on experience. In my own practice I have designed structures up to and slightly exceeding 500 ft. in height on the basis of a wind pressure of 30 lb. per sq.ft., with satisfactory results. These structures have been comfortable for the occupants and have furnished a rigid frame for the steel erectors. It is quite possible that the wind pressure might have been decreased somewhat, but I do not believe that the few tons of steel saved would have been worthwhile.

We are working now on the preliminary designs of a structure higher than the Empire State Building, and I am using a wind pressure of 30 lb. per sq.ft. up to 500 ft., 40 lb. per sq.ft. from there up to 1,000 ft. and 50 lb. per sq.ft. above the 1,000-ft. level.

Our engineering societies should make it their business, in cooperation with interested structural engineers, to ascertain what maximum wind pressures may be expected at the higher elevations. I do not believe that speculation or discussion will determine these facts.

In my opinion a structure designed consistently for

the proper wind pressure will be a satisfactory one from the point of occupancy. I have always used the cantilever method.

What we need is a determination of maximum pressures at the higher elevations.

FRANK A. RANDALL,
Chicago. *Structural Engineer.*

Study Behavior of Present Buildings

I FEEL we have a great deal yet to learn in connection with the subject of windbracing and that the time has come when we will have to test our methods of figuring against the behavior of buildings in heavy winds. There is a long road ahead of us before a solution is reached. However, I feel sure that in the next two or three years we will have a much better knowledge of the subject than we now have.

H. G. BALCOM,
New York City. *Consulting Engineer.*

Rigidity the Modern Problem

I AM keenly interested in the recent studies with regard to the effect of wind pressures on tall buildings, and I hope and believe that out of these studies there will be developed theories and data that will be exceedingly valuable to structural engineers.

I personally believe that for buildings up to 50 stories or thereabout in height, the older methods of design are sufficiently safe and economical to warrant their continued use. I refer particularly to the so-called portal and cantilever methods about which Robins Fleming has written so extensively. When we tackle the building of 75 stories or more, I feel that these methods are not entirely satisfactory, especially as to the distribution of the pressures throughout the frame of the building. I am inclined to accept Mr. Spurr's method for such buildings as being the best adduced thus far. I also agree with Mr. Spurr that the extensive use of split-beam connections for such structures does not contribute adequate stiffness to resist vibrations and impacts due to heavy gusty winds.

The use of kneebraces and K-bracing for tall structures is almost necessary in order to gain sufficient rigidity to make them comfortably habitable. There seems to be no doubt but what some buildings in New York, while probably entirely safe, are lacking in rigidity to the extent that tenants are actually affected either physically or mentally, and perhaps both, by the vibrations that occur during heavy windstorms. Some of these buildings are not even of exceptional height.

It would seem that Mr. Coyle could perform a great service to the engineering profession if he would publish more of the charts that he has made with his seismograph machine, and at the same time give a short description of the method of bracing used in the particular structure. It would of course not be necessary to name the building or the engineer; but the charts themselves, without a knowledge of the system of windbracing utilized, are really of no great value.

The subject of windbracing is more or less in its infancy and there remains a tremendous amount of work to be done before engineers can predict with any degree of certainty what results will be obtained under various methods of calculation. Such buildings as the Empire State do not contribute a great deal in this matter for the reason that their bulk is so great that other parts of the building combined with the structural frame produce, with almost any system utilized, an entirely satisfactory degree of rigidity. Our greatest gain will result from the analysis and testing of tall slender towers such as the Chrysler and the Manhattan Company buildings.

Some time ago some engineers professed great reluctance to give out any information regarding their outstanding buildings on the grounds that the methods that they used were trade secrets. I am glad to note that this attitude has apparently disappeared and that, with few exceptions, most engineers are entirely willing to give to the profession any information or experience that they have at their disposal. It is only by such an attitude that any tangible results can be obtained and I look for tremendous strides in this problem during the next few years. The time will come when we shall be able scientifically to determine the stiffness that is contributed by walls, floors, partitions, etc., as well as by the steel frame itself. When that day is reached engineers will be able to design efficiently and economically the steel frame for any conceivable type and size of building, knowing that their designs can be counted to function as calculated.

ALBION N. VAN VLECK,
New York City. *Hurlbut & Van Vleck, Consulting Engineers.*

Wind Design an Art

SUCH an exposition on tall buildings as is given in the Feb. 19, 1931, issue of *Engineering News-Record* is very timely, for we are in a period of rapid changes and development, and it behooves us to measure our recent steps that we may more accurately gage and prepare ourselves for the future.

Great stress is laid, and properly so, on the need of cooperation among the specialists. Such cooperation can be expected among men only when each has a mutual appreciation of and a respect for the problems of the others, as well as a general knowledge of how the others prosecute their work.

No one feature in high buildings is entitled to more consideration than that which is generally termed the windbracing. I fear that there is perhaps a feeling among some that wind design will soon become a matter of rule of thumb; that the method of design for all high buildings will soon be agreed upon by a few experts and that, from that time on, a recent graduate with a textbook can safely be trusted to take charge. Papers on the solution of particular problems by eminent engineers may have a tendency to generate the idea, even among those who ought to be better informed. This thought is not nebulous, as the following narrative illustrates. A few months ago a man visited two established engineering offices in New York, in each of which he expressed himself in about this manner: "I am an engineer and I have designed several buildings under fifteen stories in height. I have just been intrusted with the design of a 45-story tower building. You have designed many important high structures, and I thought you might tell me how you design windbracing. Or, if you cannot make it clear briefly, can you tell me of a man I might hire, at not too high a salary, a man who has worked for you perhaps on such designs and can do this part of the work for me?"

The visitor unhesitatingly admitted his own incompetence for this particular undertaking, and in his ignorance assumed that the engineer could or would communicate to him in a brief space of time the insight into such problems built up by his long experience and genius. Perhaps he succeeded in his quest—I do not know—but

what a sad situation exists if even one owner's interests have been intrusted to such hands.

The world at large hears the engineers exchanging ideas and telling experiences through the pages of *Engineering News-Record*, and care must be taken that technical discussions do not obscure the truth back of it all. The conception of ideas and broad vision, founded on ever-widening experience, will always be required to lead standardization, the only function of which is to eliminate drudgery. Too often it defeats its own end. Designing is and always will be an art.

JOHN W. PICKWORTH,
New York City. *Weiskopf & Pickworth, Consulting Engineers.*

Lateral Resistance in Walls

MY OWN experience is limited to buildings of much lesser height than those discussed in your Feb. 19 issue. However, the thought uppermost in my mind while reading the discussion of methods of design against wind pressure was that masonry walls are of much more importance in furnishing resistance to lateral forces than is apparently brought out in these articles. I have recently been serving as a member of a commission to report on the lateral resistance against earthquakes of a 26-story building in San Francisco. I have computed the rigidities of the interior and wall bents and found that the wall bents, which are considered to be a combination of structural-steel frame and inclosing masonry, furnished practically all the resistance.

The deflections of the various stories for an assumed force were computed. These deflections were inserted in a formula giving the period of the building. The result was a computed period that corresponded very closely to those that we have measured in a number of high buildings in San Francisco. A model was then constructed of this building and subjected to vibratory motion simulating earthquake action. The resultant periods agreed closely with our computations. I am convinced more than ever that until the walls of the building have fractured, they furnish the major part of the resistance to lateral forces.

H. D. DEWELL,
San Francisco. *Civil Engineer.*

Developments in Materials and Testing

Chicago meeting of A.S.T.M. distinguished by first exhibit of testing equipment and record attendance—Specification work not notable, but reasearch activity at high level

Engineering News-Record Staff Report

A NOTEWORTHY exhibit of testing equipment added to an unusually attractive program of papers and a record attendance signalized the meeting of the American Society for Testing Materials last week at Chicago—the second meeting in a quarter century away from the traditional gathering at Atlantic City. Interest was heightened by the fact that three other societies cooperated in certain of the sessions. Rather more than the usual number of intersociety and outside committees made the meeting an occasion for working sessions, among them the reactivated joint committee on concrete and reinforced concrete. Attendance surpassed all prior records, 1,500 being registered against less than 400 last year.

Six of the sixteen sessions of the meeting were occupied by symposium groups of papers; one, on effect of high temperatures on properties of metals, alone took up two long sessions. Malleable iron castings, abrasion testing of rubber and weathering resistance of masonry materials were also represented. The remaining papers ranged over a wide field. Corrosion testing, fatigue of metals and observations on concrete were prominent, as usual, but a number of individual papers brought forward important innovations.

The first results of the investigation of Mount Hope Bridge wire were made public; they show low endurance strength but do not explain the spontaneous breaking of the wire. "Damping capacity," or the mechanical hysteresis of solids as measured by a vibration machine, was proposed as a measure of utility of material for certain purposes. Torsion tests of hardened tool steel were shown to give a more sensitive index of its toughness than tension tests. The development of a special rubber for the model-dam tests of the Aluminum Company of America was described. Some unexpected variations in the effect of dissolved oxygen on corrosion were reported. New wall tests were presented, the walls being built of concrete blocks. Among the interesting developments in concrete was a study of the change in strength of central-mixed concrete with time of transit, an extensive investigation of road concrete made with added stone, and data on the harmful effect of heat generated in the setting of heavy concrete masses.

Society Events

Dr. A. H. Pfund, of Johns Hopkins University, was awarded the Dudley medal for his paper "Hiding Power Measurements in Theory and Practice," presented last year. Dr. A. Nadai, of the Westinghouse Electric & Mfg. Co., delivered the annual Marburg lecture, on "The Phenomenon of Slip in Plastic Materials." He pointed out the mathematical analogy between the form of sand piles formed on irregular base surfaces and the stress distribution in a plastic body when flow begins.

F. O. Clements, technical research director of the General Motors Corp., Detroit, was elected president.

Use of Specifications

At a session held with the Western Society of Engineers a symposium was presented consisting of five papers describing the practical use of specifications by producer and consumer of engineering materials. From the viewpoint of the steel producer, John Brunner, of the Illinois Steel Co., discussed the indispensableness of specifications in insuring fair competition and insuring a high quality of product. To the steel user, according to P. Parke, of the Pullman Co., specifications are a standard or check upon the material purchased and prevent costly delays in manufacturing processes that would result from the use of faulty or variable material.

The concrete producer's case was discussed by J. P. H. Perry, of the Turner Construction Co. Concrete is different from most other engineering materials in that it cannot be tested during its fabrication but only after the plastic material has set and attained its strength. Though concrete is dependent on many factors for its strength and economy, properly drawn specifications will assure a quality product. Arthur R. Lord, consulting engineer, took up the question from the concrete user's side. The wide range uses of concrete, from gravity dams to architectural ornamentation, require thorough specifications to assure a safe finished structure.

Specification Changes

Work on specifications brought few developments of general interest, much of the work being routine revision and drafting of specifications. A few of the more important changes are noted.

In steel, a new specification has been written for structural steel of higher strength (60,000 to 72,000 lb. per sq.in.) and may be issued later in the year. Reinforcing-bar specifications raised some discussion about machining the testpieces from deformed bars, but the matter was compromised pending final adjustment. Work is in progress to develop specifications for fabricated pipe (riveted, lock-bar and welded), in conjunction with the American Standards Association.

Several new specifications for light-alloy products have been drafted, as well as several for electrical-heating material. Hollow building tile has been renamed "structural clay tile" by the committee on tile, following the lead of the manufacturers. Fire tests have been eliminated from the tile specifications. New definitions have been drafted for the terms bitumens, asphalts, flux, tars and pitches. Specifications for gypsum board were revised, and the term "gypsum lath" adopted in place of "gypsum plaster board" when referring to plaster base.

An important recommendation relating to cement specifications was proposed and adopted. It concerns the practice of a few highway departments to require that cement when delivered on the job must not be above 125 deg. F. in temperature. The cement committee stated that it is engaged in studying the effect of cement temperature, and pending its conclusions requested that the limiting clause be not used.

On the question of standardizing the use of round-hole or square-mesh screens for coarse material, the subcommittee on coarse screens has recommended to the committee on methods of testing that sieves with square openings be used for crushed stone, gravel and slag concrete aggregate. It is understood that the committee on concrete aggregates has already standardized on square-opening screens.

Because of the difficulty manufacturers have had in making rubber pump valves according to the standard A.S.T.M. specifications, a new tentative specification was proposed.

Current Research Work

Yield-point studies on structural steel, begun five years ago, brought a further report, this one on the relation between speed of head of the testing machine and rate of strain. The ratio was found to range from 0.019 to 0.057, independent of speed but varying somewhat with thickness of specimen.

Life tests of electric-heating wires are in progress in a toaster unit running two minutes on and two minutes off, at six laboratories.

Slate is being studied as to weathering and as to absorption test methods; on the latter, results indicate that soaking before drying is preferable to drying before soaking.

New Test Methods

A special depth gage to measure the Brinell impressions of a $\frac{3}{4}$-in. ball in testing the hardness of railway rails was described by H. H. Morgan and J. R. Mooney, of the R. W. Hunt Co. The gage measures from the top of the surrounding ridge to a point part way down the impression; results check with standard Brinell values. In discussion it was argued that the true value of hardness is measured by depth below undisturbed surface rather than below rim.

Torsion tests as a sensitive discriminant of hardened tool steel were discussed by J. V. Emmons, of the Cleveland Twist Drill Co. Stress-strain curves from such tests show a larger plastic range and larger total deformation than tension tests. The product of total deformation and ultimate torque was proposed by the author as "coefficient of toughness," found to be helpful in studying variations of heat-treatment. A 500-deg. draw from a 1,750-deg. quench gave maximum strength, while a 450-deg. draw gave a very high maximum of twist angle; both values were low at 750-deg. draw.

G. S. von Heydekampf, in a paper on "Damping Capacity of Materials," described methods of measuring the energy absorbed in elastic hysteresis of metal. One method uses a power-driven oscillator arm which bends a specimen of the metal back and forth, the power used to drive the arm to a known amplitude of swing being measured. He argued that this damping capacity is significant in describing a property of the material which may be either harmful or beneficial, depending upon the use to which the material is to be put. H. H. Judson proposed a shear test for cast iron to replace the tension test now in use.

Corrosion

Elaborate investigations of corrosion, both by field exposure and by accelerated test, are being carried on by a number of the standing committees of the society. Most recent is a comparison of corrosion tests of stainless steel, on which fifteen laboratories are working. Air exposure and immersion exposure tests of plain iron and steel sheets are progressing; the latter have been going on since 1927, but results are not yet definite.

Galvanized sheets are showing failures after four years in strong industrial exposures (Altoona and Pittsburgh). Exposure tests of coated hardware, over a period of nearly two years, are showing in most of

the articles exposed better performance of hot-dip galvanizing than of comparable coatings. These tests are to be extended to electroplated coatings. Galvanized culvert tests are to be started next year.

Embrittlement of hot-dipped galvanized structural steel has been put under investigation during the past year at Battelle Memorial Institute, so far without results.

Atmospheric corrosion tests of non-ferrous metals have been extended to additional exposure locations, at Phoenix, Ariz., and La Jolla, Calif. Die-casting exposure tests, covering 25,000 to 30,000 specimens, at ten locations, are nearly completed.

Several new facts on corrosion were brought out by papers. E. C. Groesbeck and L. J. Waldron, of the Bureau of Standards, investigated the effect of dissolved oxygen on submerged corrosion, with anomalous results, the curve of oxygen effect differing for alkaline and acid solutions. Electrolytic effects, or the nature of the protective film, may explain the differences. Accelerated-corrosion tests of sprayed metal coatings by L. Pessel showed lead to be the only effective protection against moist carbon dioxide and sulphur dioxide in combination. Dr. D. J. McAdam added confirmatory and supplementary data to his prior studies of the acceleration of corrosion by stress.

Endurance Strength

A half-dozen papers dealt with endurance on fatigue test results; in addition B. P. Haigh and T. S. Robertson described an axial-loading machine. Weld metal was tested in endurance by R. E. Peterson and C. H. Jennings, of the Westinghouse Electric & Mfg. Co. Direction of deposition did not affect the results markedly. Peening was beneficial, only the outer layer requiring to be peened; but annealing was of little benefit.

In a new comparison of axial with reversed-bending endurance, R. D. France found, in agreement with H. F. Moore's earlier results that the axial endurance is lower, being about 80 per cent of the reversed-bending value. Results published some years ago giving equal values for the two tests are not confirmed. Fatigue tests of copper, brass and duralumin were reported by Prof. H. F. Moore and R. E. Lewis, from the laboratories of the University of Illinois, and tests of brass by Prof. J. B. Kommers from the University of Wisconsin.

Weathering of Masonry

A symposium on weathering characteristics of masonry materials emphasized the action of weathering agents, the large financial losses, tests and methods of prevention. Millions of dollars annually are spent in the repair, upkeep, rebuilding or major revamping of buildings or other structures because of weathering damage. Examples noted by H. S. Brightly included $100,000 for repairs to a building in the East, another tall building which will have to be torn down and a $200,000 expenditure for a third. Watertightness is one of the most essential things to observe. Frost, efflorescence, soot and biological action are a few of the decaying agencies against which designers take too little precaution.

Ephrem Viens, director of the testing laboratories of the Ottawa (Canada) department of public works, recounted the requirements of good concrete, sound aggregate and satisfactory workmanship. The weaknesses of concrete made without scientific control were noted.

The mechanism of weathering of structural clay products as produced by temperature change in the presence and absence of water, wetting and drying, percolation of water, crystallization of soluble salts and the action of the atmosphere was covered by J. W. McBurney, research associate of the Common Brick Manufacturers Association at the Bureau of Standards. He recommended more study of weathering in the field, to help in developing a standard freezing-and-thawing test. L. O. Hanson, University of Wisconsin, outlined an investigation into the durability of various crushed rocks and mortars to develop an accelerated weathering test. Freezing and thawing tests on Wisconsin stone agreed with natural weathering. No relation was found to exist between durability and absorptive properties. Weathering tests for clay products were outlined by H. D. Foster, Ohio State University, and those for stone by D. W. Kessler, Bureau of Standards.

Cement and Concrete Progress

Concrete, though not as active a subject as at other recent meetings, provided a group of notable papers. Prof. W. A. Slater, of Lehigh University, reported tests of central-mixed concrete transported 22 hours in an agitator drum without mixing blades. Test samples taken from the drum at intervals showed a progressive stiffening of the mix, which originally was fairly wet (slump 6 in. or more) and finally reached the consistency of fairly dry paving concrete. No loss of water or other ingredients occurred, but the apparent cement content (material passing 100 mesh) increased, while the sand apparently decreased, an effect attributed to attrition of sand. The same effect appeared even more strongly during long-continued mixing in a concrete mixer. The strength of the concrete increased with the time of transporting.

"Temperatures Developed in Mass Concrete and Their Effect Upon the Compressive Strength," by Profs. R. E. Davis and G. E. Troxell, described work on 3-ft. and smaller insulated cubes. High temperatures were reached in the interior, some brands of cement heating more than others. Rich mixes reached higher temperatures than lean mixes. Dut to the temperature the early strength was high, but later gain in strength was less than for concrete cured at 70 deg. F.; and after a period ranging from a week to several months the normal concrete was much the stronger.

One of the elaborate concrete studies of the Bureau of Public Roads was reported by F. H. Jackson, engineer of tests of the bureau. Its purpose was to investigate the value of added stone, beginning with 1:2:3½ concrete and going to 1:2:5¼, with different aggregates, different consistencies and different finishing methods. The test object was a 9-ft. width of concrete road slab, divided into 265 lengths of 9 ft., each made of a different mix. Beam tests were made on specimens cut from the slabs, as well as tests on separately molded beams and cylinders. The finishing machines produced a good surface, but the leaner slabs were found to have much honey combing inside. A machine with screed and tamper was better than those without tamper in this effect. One leading conclusion was that the finish of the slab is not evidence of satisfactory concrete, and that the slump should not go below 2 in. for best results.

Accelerated freezing and thawing tests on concrete aggregates were described by Prof F. C. Lang and C. A. Hughes, of the Minnesota highway department, who developed a short and severe cycle, including freezing in calcium chloride brine at zero Fahrenheit for half an-

hour, five minutes in hot water and five minutes in ice water. Tests on the aggregate were checked by tests on concrete cylinders made with the same aggregate. Wide differences among different aggregates were found.

An ingenious departure in workability measurement was made by D. M. Burmister. His device is a shallow trough of segmental cross-section, in one end of which the concrete is placed, spreading thence along the trough under repeated 1-in. drops of the free end. Numerous tests of concrete showed close correlation with slump and flow-table results.

R. L. Brown and E. C. Clark measured the effect of time of loading on bond stress in beams, using loads 90 to 95 per cent of the expected ultimate. The test was not continued sufficiently long to produce failures, though slip occurred.

F. R. Wicks, of San Francisco, discussed crystalline talc as an admixture. Papers presented as appendices to the concrete committee report included "Analysis of Fresh Concrete," by Prof. W. M. Dunagan; "Uses of Calcium Chloride for Curing Concrete," by H. S. Mattimore and H. H. Miller; "Effect of Curing Methods on Concrete Strength," by Prof. F. C. Lang; "Pavement Core-drilling Practice," by L. W. Teller and P. J Freeman; "Determining the Cement Content of Set Concrete by Chemical Analysis," by H. F. Kriege; "Effect of Aggregate on the Elastic Properties of Concrete," by P. M. Noble; and "Terminology Applying to the Study of Concrete Structures in Service," by F. R. McMillan.

Hollow-Block Walls

Douglas E. Parsons presented an analysis of test results on large masonry specimens of clay hollow units and concluded that factors other than the strength properties of the units have a marked influence on the strength of the walls. For end-construction masonry, the proportion of the gross sectional area bedded in mortar is an important factor. In side-bearing construction the details of design of the units appear to be of direct importance, as does the bending strength of the shells.

The relation between the strength of a masonry wall and the strength of the units of which it is built was further discussed in a paper, "Tests of the Stability of Concrete Masonry Walls," by F. E. Richart, P. M. Woodworth and R. B. B. Moorman, covering tests on 60 walls 6 ft. long and 9 ft. 6 in. high, and 42 walls 2 ft. 8 in. long and 4 ft. high, all built of hollow concrete blocks. The compressive strength of the walls was shown to be closely dependent upon the compressive strength of the units, with an average ratio of wall strength to block strength of 0.53. The ratio of compressive strength of large and small walls was found to be fairly constant, 0.91. Eight-inch walls with face-shell mortar beds were found to have four-fifths of the strength of similar walls with full mortar beds. Composite walls of facebrick and concrete units showed satisfactory behavior and strength.

Tests of the "Fire Resistance and Stability of Walls of Concrete Masonry Units," by C. A. Menzel, reported the results of tests to determine the effects of fire on 100 sample walls. The walls, built of hollow concrete units, were subjected to intense heat on one side in a specially constructed gas-fired furnace. The fire-resistant property of the wall was determined by the temperature rise on the unexposed face, measurement being made of the time required for that face to attain an average temperature of 250 deg. or a temperature at any point of 325 deg. F. The tests indicated that the fire endurance period increased with the proportion of fine aggregate used in making the blocks and with the cement content of the concrete. With a given grading and cement content, the type of aggregate used (gravel, cinders, cinders and coal, haydite) had an important effect on the fire endurance period. The period of an 8-in. wall was increased 30 per cent by a one-half coat of gypsum plaster on one face and 60 per cent by coats on both faces. Improvement in both endurance period and strength after exposure was obtained by more complete bedding at horizontal joints.

Special Papers

Rubber Test Model of a Dam—At the New Kensington laboratory of the Aluminum Company of America an elaborate model test of its Calderwood arch dam is in preparation, involving water-loading and extensive strain-gage studies on a 1:50 reproduction of the dam. Means are included for taking account of foundation yield, by making part of the foundation of rubber blocks restrained in variable degree by bracing. While the project as a whole has not been described in public, the study made to find a suitable rubber compound for the model was outlined by R. L. Templin and R. G. Sturm, of the company's laboratory. The selected material has modulus of elasticity of about 500 lb. per sq.in., specific gravity of 2.40, expansion coefficient 0.00012 per degree Centigrade, Poisson ratio nearly 0.50, and hysteresis loop width about 1½ per cent of maximum strain; creep is negligible at the working stresses (15 to 20 lb. per sq.in.).

Mount Hope Wire Test—The first test results from the Bureau of Standards investigation of the failed Mount Hope Bridge cable wire were reported, these being on fatigue. They do not help to explain the failure, but show that the galvanized coating lowers the endurance strength. As described by S. M. Shelton, of the bureau staff, a special method of testing was devised, using a 66-in. length of the wire (0.185 to 0.195 in. diameter) as a rotating-beam specimen under two-point loading, the weight of the wire giving an added stress at midspan of about 6,000 lb. per sq.in. With careful manipulation the wire ran perfectly quiet. The tests showed the galvanized wire to have an endurance limit of 50,000 lb. per sq.in., while the same wire after stripping the galvanizing had a 60,000-lb. limit. A machined and polished specimen of the usual fatigue-test shape reached 100,000 lb. per sq.in.

Emulsified Asphalt—In a paper on "Modern Paving Emulsions," C. L. McKesson, of the American Bitumuls Co., San Francisco, gave a group of tests for "quick-breaking" emulsions. They include a washing test to determine the degree to which the asphalt has set in a given period of time, a settlement test to determine the tendency toward sedimentation, and the Myers demulsification test. Distillation, viscosity and evaporation tests also are desirable, and for mixing emulsions tests for miscibility and stone-coating properties are required. But comparisons of the "break" in the Myers test, it was stated in discussion, do not always agree with relative time of the break in the road.

Abrasion Testing of Rubber—A group of papers described progress in developing methods of testing the abrasion-resisting properties of rubber that will simulate conditions of actual wear. An angle-abrasion machine and its operation were discussed by J. L. Tronson and A. W. Carpenter. The machine consists essentially of a

rubber ring driven by a wheel of abrasive material under constant pressure. The results are comparable to those obtained from road tests of tires. Abrasive wear was found to increase with extended overcures and aging. Five other types of abrasion machines were described in papers by Warren E. Glancy and C. A. Klaman, all of which showed satisfactory agreement in results with those of road tests. Tests for determining the tearing strength of rubber sheets were described by A. W. Carpenter and Z. E. Sargisson. The tests indicate that the resistance to tear depends on the state of cure of the rubber, being reduced by both undercure and overcure.

High-Temperature Effect on Metals — Nearly 30 papers were crowded into two joint sessions of the society with the American Society of Mechanical Engineers, on the effect of high temperatures on properties of metals. Steam power practice, oil-refining, ceramic, chemical and other industries are concerned. One session was devoted to the requirements of industry, the other to present knowledge of metal properties. Thermal and elastic properties, resistance to corrosion and wear, and creep under continued load were discussed at length.

LETTERS TO THE EDITOR

Condition Surveys of Buildings

Sir—The article, "Rules for Condition Surveys of Buildings," by W. T. McIntosh in your edition of June 18, 1931, was both interesting and timely. Having made condition surveys of many buildings, I think Mr. McIntosh's suggestions are constructive and should lead to better results.

Referring to Mr. McIntosh's rule 9 for making reports: It has been my practice to describe the exterior first, then the roof, the top floor, the floor next below, etc., to the basement. I have found this order better than the reverse order suggested by Mr. McIntosh because, first, many buildings have elevators and it is easier to go to the roof and then walk down. When buildings have no elevators, it is better to walk to the top when the party is fresh, as, at best, making a condition survey is a very tiresome piece of work. Secondly, if a building is out of plumb or has partly settled, the damage is usually most noticeable at the top. Having located such damage, it can be traced from floor to floor as the party goes downstairs. Frequently damages in rough basement or cellar walls are hardly noticeable, while at the top story they would be of considerable dimensions. If the order of examination is from the basement up, damages found on the top floor might necessitate a re-examination of the basement or cellar.

New York, N. Y.,
June 22, 1931.

H. DEB. PARSONS,
Consulting Engineer.

Are Drivers' License Laws Effective?

Sir—In the March 19 issue of *Engineering News-Record* there is an editorial "Fifty Miles and Licenses," containing several statements open to question. In discussing the licensing of drivers of motor vehicles the editor makes the statement that there is a 29 per cent lower accident rate in states with standard licensing. This figure is probably taken from a paper by Sidney J. Williams, director of the public safety division of the National Safety Council. It has been frequently used; but, in the opinion of the writer, it is misleading without a statement showing how it was obtained.

In the paper referred to a study was made of motor vehicle accident rates in nine states. This study shows, to quote Mr. Williams, "that the nine states that have passed drivers' license laws with examination since 1916 have had, since the enacement of such laws, 29 per cent fewer automobile fatalities than they would have had if they had experienced the same percentage increase that occurred in other states reporting to the U. S. Census Bureau." It may be granted that the figure of 29 per cent fewer accidents in these states is correct (although that is open to question when the records of *all* the states are considered); but why assume that the lower accident rates in these states are due to drivers' license laws? There are other elements that enter, such as density of population, number of automobiles, average number of miles driven per car per year, general conditions of highway development and many others. This much is true: If drivers' license laws are effective, then the *good effects should be cumulative.*

Here is the 1928-1929 record of fatalities for the nine states that have drivers' license laws. The percentage change over the preceding year is given, a plus sign indicating an increase, and a minus sign indicating a decrease.

State	1928	1929
Arizona	—10.6	+27.3
California	+ 4.9	+20.1
Connecticut	+30.9	+ 0.2
Maryland	+ 5.1	+12.3
Massachusetts	+ 3.2	+ 7.1
New Jersey	+ 4.1	+17.1
New York	+ 6.7	+14.6
Pennsylvania	— 3.9	+ 5.6
Vermont	+ 9.1	— 3.0
Average change for nine states	+ 5.5	+11.2
Average change for all reporting states	+ 6.3	+10.3

These figures show clearly that, so far as the records for these two years go, there is no distinct advantage in a state having a drivers' license law.

Three states had such laws prior to 1916. The records of motor vehicle fatalities in these states are as follows:

State	1928	1929
District of Columbia	+ 6.5	— 6.7
New Hampshire	— 2.7	*
Rhode Island	+23.1	—11.7
Average	+13.45	— 9.2

*Data unavailable.

In the analysis referred to three states are taken as typical of those that have no drivers' license laws. Here are the records of motor vehicle fatalities in these states for the years indicated:

State	1928	1929
Indiana	+11.7	+ 9.5
Louisiana	+16.1	— 5.7
Oregon	*	—11.2
Average	+13.9	— 2.5

*Data unavailable.

In the editorial referred to Illinois is cited as a state in which a drivers' license bill was killed two years ago. In 1928 the increase in motor vehicle fatalities in Illinois was 16.4 per cent; in 1929, without a drivers' license law, the decrease in deaths from motor vehicle accidents was 2.5 per cent. The records by states for 1930 are not available to the writer; it is possible that these would show a wide variance from the data given for 1928 and 1929. But it is certainly clear that there is little data in the records of motor vehicle fatalities for the past few years to support the enactment of drivers' license laws in all of the states.

It should be clearly understood that no particular fault is found with the analysis of motor vehicle accidents as contained in the paper referred to. But anyone who will make a thorough study of the records of motor vehicle accidents will be able to take a set of premises or a particular group of states and arrive at various contradictory conclusions.

The principle of the licensing of the drivers of motor vehicles is undoubtedly sound; that better results are not accomplished by such laws is due largely to the types of laws enacted in the separate states and to laxity in enforcement. The conclusion of the editorial referred to above is pertinent: "Better a license law with teeth, or none at all." And, it might be added: better the strict enforcement of laws that we now have, than the making of new laws for the further harassment of the public.

March 24, 1931.
Raleigh, N. C.,

HARRY TUCKER,
Professor of Highway Engineering,
North Carolina State College of Agriculture and Engineering.

NEWS OF THE WEEK

Port Authority Created for Philadelphia-Camden

In a special session called for the purpose the legislature of New Jersey on June 29 approved a bill creating a Delaware River Joint Commission to supervise transit and port development in the Philadelphia-Camden area. A similar bill has been passed by the Pennsylvania legislature. The new commission will be a bi-state body similar in organization and purpose to the Port of New York Authority, and will supersede the Interstate Bridge Commission. It will take over and operate the Philadelphia-Camden Bridge, for which it will pay the two states $26,000,000.

Canada Begins Investigation of Beauharnois Project

Investigation by a special parliamentary committee into the Beauharnois Power Corp.'s undertaking on the St. Lawrence has commenced at Ottawa. One feature of the proceedings to date is a frank admission by the Beauharnois counsel that the company's detailed plans have never received the approval of the federal government. In admitting that it had proceeded with the project in advance of authorization by the government, the corporation contended that such authorization was unnecessary so long as the work did not interfere with the interests of navigation. The corporation is working within its own property and the only chance it is taking, according to counsel's argument, is that when construction is completed navigation will be found to be affected.

Fire Destroys Top 7 Floor Forms of 21-Story Building

FIRE of undetermined origin destroyed seven floors of formwork on the top of the 21-story section of the Starrett-Lehigh railroad warehouse in New York shortly after 5 o'clock on the evening of June 29. Starting on the nineteenth floor, the fire spread rapidly downward to the fourteenth floor, which had been poured three days previously. It was confined to a structural steel tower section that will house nine elevators, located in the center of the south side of the building. A strong north wind kept the fire away from the recently completed east portion of the building, seventeen stories high, and from the east and north sections of the building, completed to the eighth story, all of reinforced-concrete construction.

Steel in the tower section had been topped out. Firemen were seriously handicapped by the constant falling of light beams not yet placed, and by lack of water pressure above the fourteenth floor. Attempts to force water above this level resulted only in frequent bursting of hose.

Apparently none of the heavy steel in the columns and main beams was damaged, although some of the light steel members will have to be replaced. Machinery for the nine elevators, all in place, also apparently escaped damage except that for one of the freight cars which had been covered by a wooden shanty pending early use. The building, covering an entire block, is being erected by Starrett Bros. & Eken.

POWER HOUSE OF THE BEAUHARNOIS PROJECT ON THE ST. LAWRENCE RIVER ABOVE MONTREAL

The power house will be 1,000 ft. long and will have space for ten units of 50,000 hp. each and two of 8,000 hp. The initial installation will be 216,000 hp.

Concrete Quality and Problems of Design Being Studied

At a meeting of the Joint Committee on Standard Specifications for Concrete and Reinforced Concrete held in Chicago on June 22 and 23 considerable progress was made in the consideration of questions of concrete quality and problems of design.

In reference to design it was decided that the scope of the committee's work should include all structures of concrete or reinforced concrete which require engineering analysis. The magnitude of this program necessitates a departure from the procedure followed in the 1924 report, which was a detailed specification with special application to buildings. The proposal is to confine the present report largely to a statement of the fundamental principles and assumptions upon which rational analysis of concrete structures may be based, with such amplification as is necessary for the design of specific structures.

Concerning the quality of concrete, the dual requirement of a minimum strength and maximum water-cement ratio is proposed. The purpose of the limitation of the water-cement ratio is to avoid the use of unduly lean mixes and thus to safeguard the durability of concrete. A change from the 28-day to 7-day strength requirement is also being considered.

Recent developments in the field of ready-mixed concrete have raised new problems not covered by the former specification. The committee proposes to incorporate suitable provisions for the control of ready-mixed concrete.

On the subject of concrete reinforcement, the committee has gone on record as opposed to the provisions of permitting the machining of test specimens for determining the physical properties of deformed bars.

Reinforced-Concrete Dock for Marquette, Mich.

Arrangments have been made by South Shore Dock Co. for construction at a cost of $1,350,000 of a reinforced-concrete dock and approach at Marquette, Mich. The new dock will be located alongside of the present dock, which will be practically worn out at the end of the present iron ore-carrying season. The Marquette, Houghton & Ontonagon Railroad and the Duluth, South Shore & Atlantic Railway have been authorized by the Interstate Commerce Commission to guarantee $1,000,000 of first mortgage 5 per cent gold bonds to be issued by the dock company and sold at 97 to the Banc Northwest Co. and the First Securities Corporation, of Minneapolis.

Railway From Los Angeles to the Harbor Is Planned

Preliminary surveys of a route for a proposed new 10-mile railway line from the Los Angeles industrial district to Los Angeles harbor are being made by the Union Pacific System. Estimated cost of the line is $2,000,000. Plans for construction of the line involve the removal by the Los Angeles & Salt Lake Lake R.R. of 2 miles of track on Ocean Boulevard, California and Alamitos Aves., in the central business section of Long Beach, Calif., where vehicle traffic is heavy.

Engineers Get Back Pay—and Apology From City

Two years ago the city of Evanston, a suburb of Chicago, terminated a contract for the engineering of a lighting system costing about $1,250,000 with the Randolph-Perkins Co., consulting engineers, and sued the engineers to recover money already paid. The city council resolution and discussion preceding its adoption charged or implied a lack of ability or integrity. The engineers countered with a suit for breach of contract. Settlement has now been made, the city paying an additional $20,000 and officially withdrawing "any derogatory statements, charges, inferences or implications reflecting upon the professional integrity, good faith, ability or reputation of the Randolph-Perkins Co. as engineers."

The engineers had prepared three alternate plans for a street lighting system: one for a city power plant system, one utilizing purchased power, and a third system utilizing purchased power but laid out with the leads brought to one point so that a change could easily be made to a municipal plant. Controversy arose among the aldermen, all plans were rejected, the engineers were dismissed without payment in full and a new engineer was employed.

Work Started on Arc-Welded Steel House

Construction was recently started on what is believed to be the first house of completely arc-welded steel construction built in America. The residence, which will cost about $25,000 when completed, is being erected in the Shaker Heights district of Cleveland, Ohio. It is a two-story structure of French architecture, designed by George Howard Burrows, Cleveland architect and developer of the welded steel design for residential construction. When completed there will be about 10 tons of steel in the framework; 3-in. lightweight standard Carnegie channels and 6-in. lightweight standard Carnegie beams are the principal shapes employed. With one welder and three structural iron workers, about 4 tons of steel was erected during the first day of construction, according to the Lincoln Electric Co. All steel was cut to size before delivery to the job. All fabrication and erection welding was done on the site by the McKay Building Co., Cleveland, Ohio.

The architect states that the house will cost about 40c. per cubic foot and that the use of welded steel construction will cost only $72 more than a wood structure.

Santa Fe to Elevate Tracks at Oklahoma City

As part of the extensive program of grade separation at Oklahoma City, Okla., the Atchison, Topeka & Santa Fe Ry. will elevate its tracks for 2½ miles. About 1¼ miles will consist of sand fill between reinforced-concrete retaining walls, 10,000 ft. of these walls varying from 17 to 21 ft. in height above the footings and the remainder sloping down from 17 ft. to 2 or 3 ft. in height. The rest of the elevation will be a simple fill, without walls, the total embankment being about 560,000 cu.yd. Underpasses will be provided for thirteen streets and two double-track railroads, the present grade crossings of the Santa Fe with the Rock Island and the St. Louis-San Francisco railways being eliminated. These underpasses will consist mainly of concrete-cased steel beam spans on concrete abutments with reinforced-concrete bents at curbs and center lines.

A new bridge over the South Canadian River will consist of seven 106-ft. double-track deck girder spans on concrete piers carried to rock. This substructure has already been placed. The present passenger station will be replaced by a new building, and the four station tracks will be served by two platforms about 1,350 ft. long, with unbrella-type shelters. Grading will be started at once and contracts for the subways and retaining walls will be let in the near future. This work is under the direction of G. W. Harris, chief engineer of the Atchison, Topeka & Santa Fe Railway System, and H. W. Wagner, chief engineer of Eastern lines, at Topeka, Kan.

ST. JOHNS BRIDGE AT PORTLAND, ORE., DEDICATED

Dedication of the St. Johns suspension bridge over the Willamette river, Portland, Ore., took place on June 13 during Portland's rose festival. The bridge was built by Multnomah County to connect two sections of Portland, the St. Johns district on the east bank and the Linnton district on the west bank. It has a total length of 3,608 ft. and a suspension span of 1,207 ft. It clears mean low water by 205 ft., the highest official requirement for vertical clearance above navigable waters anywhere. The concrete roadway is 40 ft. wide. The bridge, which cost about $4,000,000, was paid for from an authorized bond issue of $4,250,000. Robinson & Steinman were the designers and consulting engineers, with R. Boblow resident engineer. Details of construction were given Feb. 13, 1930, p. 273.

Examiner Recommends Abridgement of Missouri Pacific Plans

Missouri Pacific plans for construction of a north-and-south line in the Staked Plains of the Texas Panhandle will be abridged considerably if the Interstate Commerce Commission accepts the report of O. D. Weed, its examiner, on the 333-mile project that would cost about $12,770,000.

As presented to the commission by the Texas & Pacific Northern the plan contemplates construction of a line extending from a connection with the T.&P. at Big Spring northwest 232 miles to a point 2 miles north of Vega, with branches extending from Dimmitt to Amarillo, 55 miles, and from Lubbock Junction, 66 miles north of Big Spring, to Lubbock, about 46 miles.

Examiner Weed recommends that construction should be limited to 80 miles of line between Big Spring and Brownfield and the branch from Lubbock Junction to Lubbock, 46 miles. He reports that north of Brownfield the existing roads provide convenient access to Fort Worth and Dallas.

The line from Big Spring to Brownfield, however, would give the southern part of this territory more economical and expeditious rail service to those markets and, with the branch to Lubbock, would give it direct connection with Lubbock and Amarillo, the traffic centers of the Panhandle.

Beach Erosion Board Procedure Is Established

The Beach Erosion Board created by the river and harbor act approved July 3, 1930, has been organized and has adopted rules for procedure. These rules include the following: (1) A state agency desiring cooperative studies and investigations must be represented by a competent engineer. (2) The state agency must submit its application to the district engineer in charge of the district in which the project is situated. The district engineer will forward the application to the Chief of Engineers. (3) The application for cooperation should give the authority of the agency to conduct the studies and investigations, the name of the engineer representing the agency, a map depicting the location of the project, a full statement of the nature of the project, a reference to any engineering reports on the project that are being made or have been completed and the extent to which the agency is willing to coooperate with the federal government.

If the proposal for investigation and study conforms to the law, it will be referred by the Chief of Engineers to the Beach Erosion Board for action in arranging the program of studies and investigations required and an acceptable basis of cooperation in meeting the cost.

The plan for cooperation, when accepted by the state agency, will be submitted by the board to the Chief of Engineers for approval. After approval, the studies and investigations will be carried out under the direction of the board and in cooperation with the engineer of the agency. Upon their conclusion of the investigations, the board will submit a report embodying its findings to the Chief of Engineers for transmission to the state agency.

Clements Heads A.S.T.M.; Wagner Elected Vice-President

At the meeting of the American Society for Testing Materials in Chicago last week, Frank O. Clements, technical director, Research Laboratories, General Motors Corp., Detroit, was elected president. Mr. Clements is a graduate of Otterbein College, Ohio, class of 1896. He received his Bachelor of Arts degree there in 1896, the Master of Arts degree in 1898 and was honored by a Doctor of Science degree in 1930. He earned the Master of Science degree from Ohio State University in 1899. He has been successively assistant chemist, Pennsylvania Railroad, 1899-1903; principal assistant chemist, Union Pacific Railroad, 1903-05; chief chemist and engineer of tests, National Cash Register Co., 1905-17; director of research, Dayton Metal Products Co., 1917-20; and technical director, General Motors Research Laboratories, 1920 to date.

F. O. Clements

S. T. Wagner

Samuel T. Wagner, consulting engineer, Reading Co., Philadelphia, Pa., was elected vice-president. Mr. Wagner, who is also a member of the American Society of Civil Engineers, was graduated from the University of Pennsylvania in 1881. From 1881 to 1893 he was successively draftsman, inspector, assistant to master mechanic and superintendent of shops, Phoenix Iron Co. From 1894 to 1900 he was assistant engineer in charge of the design and construction of the Pennsylvania Ave. subway and tunnel of the Philadelphia & Reading Railway for the Philadelphia bureau of surveys. From 1900 to 1902 he was assistant engineer in charge of the improvement, extension and filtration of the water supply of Philadelphia. From 1902 to the present time Mr. Wagner has been with the Philadelphia & Reading (now the Reading) first as assistant engineer on grade-crossing work, engaged chiefly on grade-crossing elimination in the vicinity of Philadelphia, later as chief engineer and since 1927 as consulting engineer.

Full Use of Hastings Dam Postponed a Year

Full use of the height of the water which the Hastings Dam creates has been delayed a year. This was determined at a hearing on June 2 before a judge of federal court in St. Paul, at which U. S. army engineers sought permission to raise the dam pool to its full height. Using the Memphis datum, the height of the river at Hastings was about 678 ft. The dam is constructed to raise the water to 696.5. Lieut. Col. George R. Spaulding, chief engineer, Upper Mississippi Division, requested permission to increase the water to this height. This would raise the water about 5 ft. at the levee in St. Paul and would create a 9-ft. channel to the Twin City lock and dam just above St. Paul. This increase in height was opposed by the packing interests, the Union Stock Yards Co. at South St. Paul, the C.M. St. P.&P. Ry. and the Burlington. An elevation of 693 ft. was agreed to.

At present upper river barges can navigate dependably only to St. Paul. Many of them do not attempt to go through the lock and dam to Minneapolis, the freight being delivered to Minneapolis by truck. With the river raised to 693 ft. at Hastings, barges may be somewhat heavier loaded as far as St. Paul and barges with present loads can go through to Minneapolis.

The railways agreed to this compromise provided they be permitted to raise and protect their trackage at once for the eventual increase to 696.5 ft., that this be taken into consideration in the award of damages, and that the river be not raised until their protective measures are completed. Judge Sanborn then directed that an order be drawn to raise the river to 693 ft. and that it include the provisions agreed upon.

$50,000,000 to Be Spent on Oil Pipe Lines in Iraq

Negotiations between the Iraq Petroleum Co. and the government of Iraq for the development of the Mosul oil fields have now been completed and the company is to proceed immediately with the construction of oil pipe lines to the Mediterranean to cost $50,000,000 or more. The pipe line will be constructed from Kirkuk and will fork at the town of Haditha, with one branch to Haifa and the other to Tripolis. The two lines have a combined length of 1,200 miles and must be completed by 1935. The Iraq government has plans for developments to be carried out in connection with the project, involving new roads, irrigation works and new buildings, and it is probable that a new railroad will be constructed across the desert to link Bagdad with the Mediterranean.

The Iraq Petroleum Co. is an international association of interests including the American Near East Development Corp., the Anglo Persian Oil Co., the Royal Dutch Shell group and a French group.

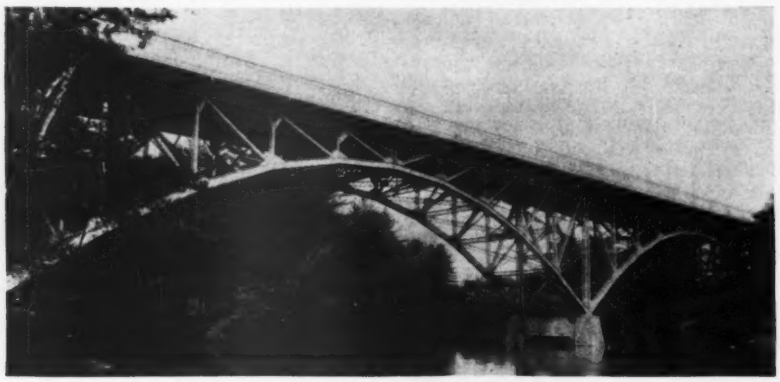
Awards Made for Most Beautiful Bridges of 1930

Announcement is made by the American Institute of Steel Construction of awards for bridges built in 1930 judged to be the most beautiful of their classes. The award for class A bridges, costing more than $1,000,000, goes to the Wabash Ave. bridge in Chicago, and the award for class C bridges, costing less than $500,000, to the steel arch highway bridge at Delton, Sauk County, Wis. The committee on award judged that there was no entry of sufficient merit in class B, including bridges costing between $500,000 and $1,000,000.

The Wabash Ave. bridge is a bascule bridge over the Chicago River which cost $1,750,000, and is owned by the department of public works of Chicago. It was designed by Thomas G. Pihlfeldt, and was fabricated by the American Bridge Co. The bridge span is 239 ft. and the roadway is 90 ft. wide. Honorable mention in this class was given to the Mid-Hudson bridge at Poughkeepsie, N. Y., a suspension bridge designed by Ralph Modjeski and Daniel Moran for the State of New York and likewise erected by the American Bridge Co. Second honorable mention was awarded to the Montreal Harbor bridge, fabricated by the Dominion Bridge Co., Ltd., for the harbor commissioners of Montreal. This is a cantilever bridge designed by Monsarrat & Pratley, Montreal.

The Delton bridge, which cost $54,000, is an arch bridge having two spans of 218 ft. 6 in. each and carrying a roadway 27 ft. wide. It was designed by the Wisconsin state highway commission and fabricated by the Lakeside Bridge & Steel Co. Honorable mention in this class was awarded to the Lachine bridge, across the Lachine Canal at Eighteenth Ave., Lachine, Canada. This bridge cost but $3,100 to erect. It was designed by R. Dorion, city engineer, and fabricated by the Dominion Bridge Co., Ltd. The bridge is but 47 ft. in span and has a roadway of 14 ft. clear, with two sidewalks.

Previous awards by the Institute have gone to the Sixth St. bridge in Pittsburgh, the Mount Hope bridge in Rhode Island, and the Mount Pleasant bridge in Westchester, N. Y.



Delton bridge, Wisconsin

River Terminal Opened at Rock Island, Ill.

A municipal river-rail terminal on the Mississippi at Rock Island, Ill., opened for traffic in June, consists of a freight house 100x240 ft. connected with a covered wharf boat 45x230 ft. by an inclosed hinged bridge housing two chain conveyors for handling freight trucks. Each conveyor is operated by a 25-hp. motor. To provide for a variation of 21 ft. in water level, the outboard end of the bridge is carried by screwjacks operated by a 20-hp. motor. The wharf boat is moored against tall circular piers of steel sheetpiles and gravel filling. Three tracks serve the dock house and two serve a wharf having a 15-ton gasoline locomotive crane for handling heavy articles or bulk freight. Wharf construction consists of a steel sheetpile bulkhead or dock wall with gravel filling, while all bank slopes are riprapped as a protection against waves and ice. This terminal, costing $380,000, including land, has been leased by the city to the Federal Barge Line. It was designed by Walter F. Schulz, consulting engineer, Memphis, Tenn.

Start Big Bascule Bridge at Chicago

Foundation work was started June 6, in the presence of Mayor Cermak and other officials, for the 200-ft. double-leaf bascule bridge at the mouth of the Chicago River to connect the north and south sections of the new outer-drive boulevard. The bridge will give 22-ft. headroom when closed. A single-leaf bascule span, for which contracts will be let later, will carry the boulevard over the slip just north of the river. Further details regarding the new structure are given on p. 34.

Wabash Ave. bridge, Chicago

Hoover Dam Notes

Two men were killed and three others seriously injured June 20 by a premature blast of a charge of dynamite in the construction of the railroad line being built by Six Companies, Inc., along the bottom of Black Canyon gorge on the Arizona side. The accident raises the total of fatalities on the project to five. The next day two more men were seriously injured by flying rock while standing too close to a charge set off at the lower portals of the Nevada diversion tunnels.

Difficulties have been reported between Six Companies, Inc., and L. E. Cramton, in charge of leases at Boulder City, regarding the extent of the contractor's operation of concessions and commissaries in the new town.

Other developments on the project during the week ended June 20 are as follows:

A full-time physician is now located at the river camp of Six Companies. All applicants for work are given a stiff medical examination. About 5 per cent are being rejected because of physical unfitness. Six Companies is now employing 1,000 men.

Day temperatures of 120 in the shade have been reported at the bottom of the canyon. A stiff breeze blowing down the canyon makes working conditions tolerable.

Drill hole No. 2 on the Arizona spillway location is down 114 ft. F. L. Ransom is examining the core to determine the depth to which the hole will be drilled.

Twenty-eight-day tests of the mix of material from Hemenway wash for the presedimentation basin gave good results.

It has been decided to obtain cores from the contraction joints in the Gibson Dam by government forces rather than by contract. The work will not be undertaken until September.

Data have been received from the manufacturers of large turbines as to the turbines they would install at the power plant. The information was referred to the Southern California Edison Co. and to the city of Los Angeles in connection with the studies they are making as to the equipment to be installed at the power plant.

There are to be at least two tunnels on the railroad down the canyon. One will be 900 ft. long and the other one 1,100 ft.

The John E. Phillips Co., San Francisco, has been awarded the subcontract for the construction of the railroad from station 355 of the construction railroad to the Arizona gravel pit. The Phillips company began work June 17 and has 100 days in which to complete the grading.

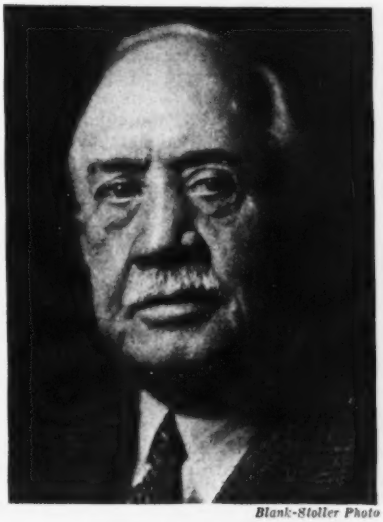
The adit in the Arizona abutment has reached a depth of 449 ft. The heading from this adit for the inner diversion tunnel has progressed 56 ft. upstream and 75 ft. downstream. In the Nevada abutment the adit has been excavated 405 ft., which is 31 ft. past the intersection of the inner diversion tunnel.

The rough grading of the Black Canyon highway on the Nevada cliff is practically completed. A shovel is operating in the Nevada outlet portal cuts of the diversion tunnels. Excavation is in progress for a highway from the Arizona outlets. A compressor station with a capacity of 4,000 cu.ft. is being installed at the outlets of the Nevada tunnels.

William L. Saunders, Chairman of Ingersoll-Rand, Dies

William L. Saunders, chairman of the board of directors of the Ingersoll-Rand Co., died in Teneriffe, Canary Islands, on June 25, while on a tour of the world.

Mr. Saunders was born on Nov. 1, 1856, in Columbus, Ga., and twenty years later was graduated from the University of Pennsylvania with the degree of



Blank-Stoller Photo

William L. Saunders

Bachelor of Science. From 1878 to 1881 he was in charge of hydrographic work and subaqueous rock excavation at Black Tom Island, New York harbor. Since then he had been identified with the interests now included in the Ingersoll-Rand Co., becoming engineer, vice-president, president and finally chairman of the board. Mr. Saunders invented an apparatus for drilling under water, the Ingersoll track and bar channelers, and gadders for quarrying stone. He was the author of several authoritative books dealing with the use of compressed air.

During the World War Mr. Saunders served on the district committee on capital issues of the Federal Reserve Board, on the advisory board of the Fuel Administration and on the military engineering committee. He at various times was a member of the New Jersey Harbor Commission, the New Jersey Board of Commerce and Navigation, the Naval Consulting Board of the United States and the advisory committee of the Federal Trade Commission.

National Conference on City Planning in Rochester

The 23d National Conference on City Planning, held in Rochester, N. Y., June 22-24, was attended by more than 200 delegates from the municipal governments and planning commissions of 29 states and the District of Columbia. The program dealt with extremely tangible things, perhaps because of the character of the city in which the conference was held—a city with a complete plan and financing program—or it may be because of the demand of conference members, who now want facts and figures rather than talks on "The City Beautiful."

"Mass Transportation on City Streets," by Thomas Fitzgerald, vice-president and general manager, Pittsburgh Railways Co., and Thomas Gordon, director, and Hawley Simpson, research engineer, of the American Electric Railway Association, opened the session, followed by sectional meetings on "The Relation of City Planning to Special Assessments," "County Planning" and "Problems of Zoning and Zoning Administration." Philip H. Cornick, National Institute of Public Administration, New York, traced the pyrimiding of assessments through carelessly prepared programs of municipal development, leading to abandonment of property and increased tax rates, while A. C. Godward, Minneapolis, claimed that assessments for improvements were not only not protested but were petitioned for by progressive people. County planning, or the enlargement of the planning unit from the city to the county, was advocated by three speakers, Lalislas Segoe, Cincinnati, E. O. Mills, St. Louis, and E. A. Howard, Milwaukee, in the interest of a more coordinated plan.

The necessity of master plans and official maps was explained by Alfred Bettman, chairman of the City Planning Commission, Cincinnati, Ohio, and others. In a paper, "The Avoidance of Blight in Areas Adjacent to Traffic Thoroughfares," Robert Whitten, New York, discussed the serious problem in connection with the creation of thoroughfares where traffic ruins the residential character of the abutting property and creates no other use because of the express character of the traffic. In such cases Mr. Whitten advocated three roadways, with the center or express way depressed.

"Is City Planning Effectively Controlling Growth of Cities in the United States?" was the subject of the presiding officer, Harland Bartholomew. His paper was an optimistic review of the results of city planning.

Britain Planning to Build Its Longest Highway Bridge

Construction will probably begin next year on the longest road bridge in Great Britain, to be built over the River Forth. It will be known as the Rosyth Bridge and will span 2 miles of water. Its cost is estimated at about $13,750,000.

WASHINGTON NOTES

By PAUL WOOTON
Washington Correspondent

Engineering Council Seeking Plan to Lessen Unemployment—New Bureau Created in Agricultural Department

MEASURES intended to provide immediate relief from unemployment will be outlined in a report that the public relations committee of the American Engineering Council is preparing in its campaign against unwise labor legislation. A subcommittee, of which F. J. Chesterman, vice-president and general manager of the Bell Telephone System of Pennsylvania, is chairman, recently held a meeting in Pittsburgh and will present its recommendations in a few weeks.

One of the committee's proposals is to select and describe several plans by which private industries can lessen unemployment, and to place such plans before the engineers of the country with the suggestion that some one of them may be applicable to the operations of a particular industry or firm. Associated with Mr. Chesterman on this committee are W. R. Webster, Bridgeport Brass Co., Bridgeport, Conn., E. R. Ruth, American Oak Leather Co., Cincinnati, R. C. Marshall, New York City, and L. W. Wallace, Council's secretary.

New Bureau to Handle Agricultural Engineering Activities

Expansion of the agricultural engineering activities of the department of agriculture has been so rapid in recent years that on July 1 a new bureau was created to handle this work, previously under the wing of the Bureau of Public Roads. The bureau will deal with the engineering problems of agriculture relating particularly to farm buildings, farm machinery, farm water supply and sanitation, insect and disease control by mechanical means, refrigeration as a means of preserving farm products, irrigation, drainage and the prevention of soil erosion.

Research in irrigation technique is directed to making present farming operations pay a profit, says S. H. McCrory, chief of the bureau, as there is little reason for opening up additional large drainage and irrigation projects in view of the introduction of machine methods on our present acreage and the curtailment of the export market for many farm products. A comprehensive study of erosion, now in progress, is aimed at developing the best type of terraces and determining the adjustments to be made in machinery for use on terraced fields.

Funds for Topographic Mapping

All engineering societies now are being circularized by American Engineering Council with a view to obtaining support for an amendment in the annual interior department appropriation acts that would liberalize the procedure for administering funds expended in topographic mapping. The plan now being followed restricts expenditures to a limited number of states, as Congress has provided that 70 per cent of the funds can be spent only on the condition that the states contribute an equal amount and that if no state funds are available federal funds cannot be used. The states also are required to share in the expense of printing as well as collecting the data under the Cramton amendment to the last bill making appropriations for the new fiscal year which commenced July 1. With the cooperation of Dr. W. C. Mendenhall, acting director of the U. S. Geological Survey, and Representative Temple, of Pennsylvania. Council has prepared a draft revising the provisions of this item to provide that $10,000 be expended annually in each state regardless of its ability to cooperate financially. The proposal contemplates an annual appropriation of $780,000, which is about the same as at present, but the amount available for expenditure only on the 50-50 basis would be reduced to $300,000 from about $540,000.

The Business Outlook

The strengthening of commodity and stock prices that followed Mr. Hoover's debt moratorium announcement was easily the outstanding feature of the week. Impressive advances were made in silver, lead, copper, tin, silk, cotton, sugar, rubber, coffee, cocoa and hides. News from production and trade centers was disappointing. Steel activity declined to the low of the year. Carloadings dropped off sharply. Electric power production continued its seasonal decline. Currency circulation again advanced to new heights, while commercial loans indicated a slight expansion. Business failures are gratifyingly smaller in number.

—The Business Week, July 1.

Engineering Societies Library to Publish Monographs

Engineering Societies Library, of New York, announces the completion of arrangements for the publication of a series of technical treatises to be known as "Engineering Societies Monographs." The editorial supervision of this series will be in the hands of a committee consisting of Harrison W. Craver, director of the library, chairman, and two representatives appointed by each of the following engineering societies: American Society of Civil Engineers, American Institute of Mining and Metallurgical Engineers, American Society of Mechanical Engineers and American Institute of Electrical Engineers. The representatives of the Am.Soc.C.E. on this committee are Ole Singstad and Charles S. Stevens.

This series will make available to the profession important technical manuscripts that are too extensive for publication in the periodicals or proceedings of engineering societies or in other journals or that are of a character too specialized to justify ordinary commercial publication in book form.

The first volume of the series is "Plasticity," by Dr. A. Nadai, formerly with the University of Goettingen, now associated with the Research Laboratories of the Westinghouse Electric & Mfg. Co. It is an adapted and revised translation of Dr. Nadai's treatise in German on this subject.

SOCIETY CALENDAR

AMERICAN SOCIETY OF CIVIL ENGINEERS, New York; summer meeting, Tacoma, Wash., July 8-10.

SOUTH CAROLINA SOCIETY OF ENGINEERS met in annual summer convention in Spartanburg, S. C., on June 22. Cooperation with the South Carolina council and recently created research commission was pledged by the society.

Personal Notes

JOHN E. SLATER has been admitted to membership in the firm of Coverdale & Colpitts, consulting engineers, of New York City.

JOHN A. GILES, former city engineer of Binghamton, N. Y., has been named consulting engineer in the pavement investigation now under way in the town of Brighton, Monroe County, N. Y., succeeding County Engineer George C. Wright, who resigned from the investigating committee recently.

LUKE ELLIS, assistant engineer of the Maryland Public Service Commission, with headquarters in Baltimore, and acting chief engineer for that body for some time, has been appointed associate engineer in the department of public works, Baltimore. The office of associate engineer was created recently by the board of estimates.

CHARLES C. MOORE, for about 30 years president of C. C. Moore & Co. Engineers, Inc., San Francisco, has retired from active participation in the management of the business and has become chairman of the board. ELGIN STODDARD, who has been vice-president for about 25 years, succeeds Mr. Moore as president of the company.

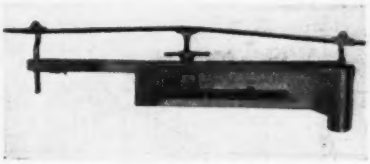
Obituary

FRANCOIS CHARLES LEBERGE, civil engineer, died in Montreal on June 19, aged 59. Mr. Leberge was a graduate of L'Ecole Polytechnique of Montreal, and later became a professor at that institution. For the past twenty years Mr. Leberge had been a member of the Quebec public service commission. He took an active part in public affairs and was a member of the Engineering Institute of Canada.

Construction Equipment and Materials

Device Measures Cable Tension

Rapid and accurate field determination of the tension in a cable or wire is the function of a tensiometer recently announced by the Hills-McCanna Co., 2349 Nelson St., Chicago, Ill. With a



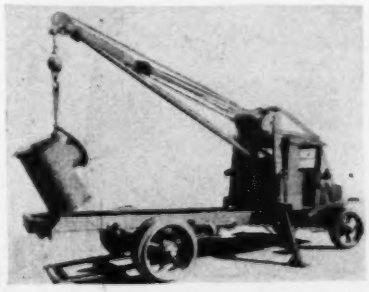
Determination of cable tension

weight of only 14 lb. and an over-all length of 2½ ft., the instrument can easily be handled even under difficult conditions. To guard against corrosion all exposed parts are either chromium plated or made of stainless steel. The standard model can be applied to wires or ropes up to 1 in. in diameter carrying stresses up to 16,000 lb. Larger capacities and designs for special applications are also available. Sensitivity is sufficient to permit the use of the instrument for weighing and to register slight changes in tension while in place.

Tension readings are made directly from a dial by simply hooking the tensiometer in place and tightening the center bearing, thus deflecting the cable. No calculations or temperature corrections need be made, nor are there liquids, glass or loose parts to cause trouble. As wrenches or other tools are not required for operation, workmen dressed for severe cold weather can use the meter without difficulty.

Crane for Truck Mounting

Only 12 in. of space behind the cab is occupied by the Howard auto truck crane, invented by W. S. Howard and manufactured by the New York Engineering Co., 75 West St., New York City. This is made in two sizes, of 4,000 and 8,000 lb. capacity. The boom is adjustable to lengths of from 12 to 15 ft., and can be raised, lowered or swung through an arc of 180 deg. These operations, as well as the hoist, are power driven in each direction through powerful worm-and-gear reductions, which are self-locking so that no brakes are required. Fitted with a snatchblock, two hoist speeds are available for miscellaneous rigging operations. Further flexibility is provided by the use of a niggerhead available as an extra.



Self-locking crane mounted on truck

Non-Clogging Centrifugal Pumps

For handling sewage, paper pulp and other liquids carrying solids the DeLaval Steam Turbine Co., Trenton, N. J., has developed a clogless pump especially designed for this difficult service. By suitably proportioning the impeller passages and volutes the pumps, which are operated at slow speeds, have been made to compare favorably in efficiency with standard high-speed clear-water pumps. Normally only two vanes are used in the impeller, proper guiding of the liquid without cavitation or shock being attained by suitable selection of the speed and of the impeller diameter. Where the pump capacity or the nature of the liquid permits, the number of impeller blades is increased to three or four, permitting higher speeds. Accessibility is secured by the use of a horizontally split casing which can be lifted off without disturbing the discharge pipe connection and after only partly unbolting the suction pipe. Raising the cap gives access to all internal parts and passages and permits the removal of the rotating element with its bearings by simply loosening the bearing cap. To facilitate inspection and cleaning, a large hand hole with easily removable cover is located on the cover half of the suction nozzle.

Single-suction shrouded or inclosed impellers are used with wide passages both between the side plates and between the vanes. The extra-long impeller housing is inclosed in a renewable bronze sleeve as a wearing surface for the stuffingbox packing. The stuffingbox is located over the hub of the impeller in order to reduce shaft overhang. A clear-water seal prevents abrasive matter from reaching the soft packing. A similar arrangement is used at the joint between the impeller and the casing. The former is protected by a bronze ring threaded upon it, while the latter has a stationary bronze ring seated in recesses formed in the casing and casing cover. A circumferential slot in the stationary ring communicates with a tapped opening to provide for sealing with clear water.

The shaft is of hammer-forged steel, extra heavy, with ball bearings spaced far apart to prevent whipping or vibration. The bearing next to the impeller is of the duplex type, arranged to take all unbalanced thrust, including the weight of the impeller and shaft when the pump is installed with the shaft vertical. The outer bearing is of the single-row type and is intended to take radial forces only. A flexible coupling which will not transmit end thrust connects the pump shaft with the driving shaft.

Dump Body Attachment for Power Graders

By designing a dump-body attachment for use with Warco center-control power graders, the W. A. Riddell Co., Bucyrus, Ohio, has created a truck-grader combination of considerable utility for the maintenance of city and country roads. With this device it is possible for an operator to start out with a load of patching material, such as screenings or crushed stone, and spend the day filling in holes in the pavement and blading down the material to form a smooth roadway. Dump-body attachments with a capacity of 1½ cu.yd., with either gravity or mechanical dumping arrangement, can now be furnished.

Dump body mounted on power grader

General Utility Crane for Railway Service

To meet increases in the size and weight of rolling stock and of right-of-way material, calling for heavier and more efficient handling equipment, three

(Continued on p. 36)

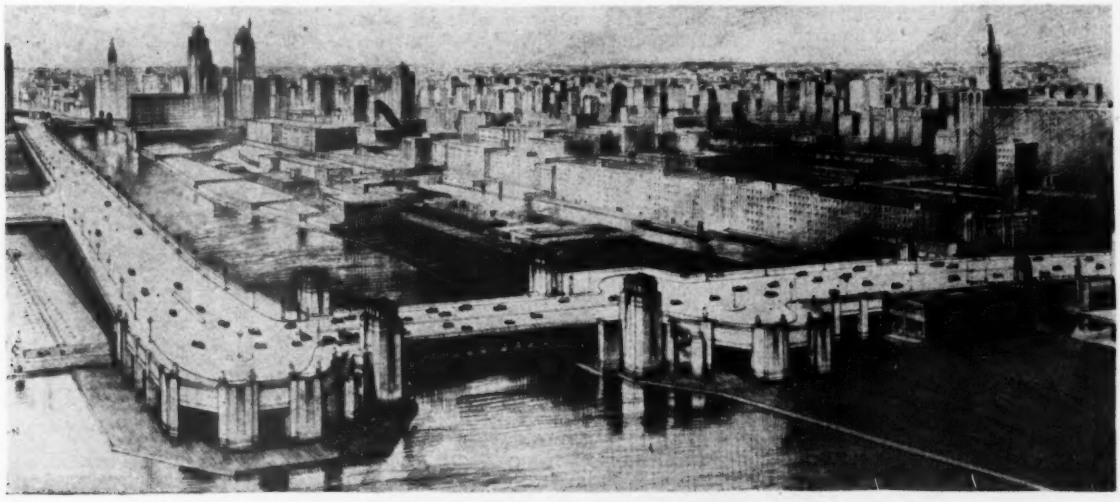
100-ton crane-pile driver

Current Construction Unit Prices

Bascule Bridge Over Chicago River

OUTER DRIVE BRIDGE at the mouth of the main branch of the Chicago River, on which bids were taken April 24, is the chief link in Chicago's new $10,000,000 Outer Drive connecting the South Park and Lincoln Park boulevard systems. The structure is a double-leaf trunnion bascule bridge 220 ft. long between masonry, 264 ft. between center line of trunnions and 356 ft. out-to-out of counterweight pits. It is 108 ft. wide with two 38-ft. roadways separated by a 4-ft. center island. There are two 14-ft. sidewalks. Bids were on both foundations and superstructure and the lowest was $1,591,327, submitted by Ketler Elliott Co., 3101 South California Ave. Second bid was $1,603,902, by Great Lakes Dredge & Dock Co., and the third $1,669,309, by Jacobson Bros. Co., both of Chicago. Unit prices are given for these three bidders. Hugh G. Young is chief engineer for the Chicago plan commission and consulting engineer for the Lincoln Park and South Park boards.

	Kettler Elliott Co.		Great Lakes D. & H. Co.	Jacobson Bros. Co.
Total amount alternate A		$1,491,236.90	$1,603,902.00	$1,669,309.00
Total amount alternate B		1,491,586.90	1,608,802.00	1,668,231.00
Total amount alternate C		1,492,253.90	1,615,402.00	1,680,063.00
Deposit made ($100,000 required)		100,000.00	100,000.00	100,000.00
	Unit Price	Total	Unit Price	Unit Price
Substructure				
Excav. (excl. of subpiers), lump sum		$27,550.00		
Excav. (bedrock), 12,000 cu.ft.	$0.70	8,400.00	$0.10	$0.35
Cement shed and field office, lump sum		3,000.00		
Cofferdams, lump sum		150,000.00		
Subpiers, 182,000 cu.ft.	1.29	234,780.00	1.25	1.00
Steel sheeting, 300,000 lb.	0.015	4,500.00	0.015	0.015
Concrete, Class I, 700 cu.yd.	16.20	11,340.00	18.00	12.50
Concrete, Class II, 8,000 cu.yd.	13.10	104,800.00	15.00	12.60
Reinforcing bars, in place, 1,400,000 lb.	.03	42,00..00	.045	.04
Structural steel, carbon, 700,000 lb.	.047	32,900.00	.05	.07
Structural steel, silicon, 320,000 lb.	.053	16,960.00	.055	.075
Pipe for submarine cable, 6,000 lb.	.10	600.00	.15	.22
Castings, 67,000 lb.	.0775	5,192.50	.09	.10
Safety treads, 24 piece	2.10	50.40	3.00	4.00
Furnishing piles, 6,500 lin.ft.	.26	1,690.00	.30	.30
Driving piles, 17,000 lin.ft.	.45	7,650.00	.40	.30
Creosoted oak timber, 16,000 f.b.m.	174.00	2,784.00	300.00	150.00
Yellow pine timber, 90,000 f.b.m.	113.00	10,170.00	150.00	80.00
Pile clumps, 4 clump	2,480.00	9,920.00	3,000.00	3,000.00
Portland cement, extra, 1,000 bag	8.75	750.00	0.75	0.75
Superstructure				
Alt. A: asphalt sidewalks, asphalt plank roadway, lump sum		810,950.00	917,000.00	1,024,237.00
Alt. B: precast concrete sidewalks, asphalt plank roadway, lump sum		811,300.00	921,900.00	1,023,159.00
Alt. C: precast concrete sidewalks, precast concrete roadway, lump sum		811,967.00	928,500.00	1,034,991.00
Lubricating system, gear trains, lump sum		650.00	1,500.00	1,000.00
Lubricating system, trunnions, lump sum		4,600.00	5,200.00	6,000.00
Additions or Deductions, Superstructure				
Structural steel, carbon, lb.	0.08		0.08	0.08
Structural steel, silicon, lb.	0.10		0.10	0.10
Reinforcing bars, lb.	0.05		0.05	0.05
Forged steel, lb.	0.20		0.20	0.20
Cast steel, lb.	0.15		0.15	0.15
Bronze, lb.	1.00		1.00	1.00
Malleable iron castings, lb.	0.20		0.20	0.20
Cement, bag	0.75		0.75	0.75
Concrete, Class I, cu.yd.	22.00		22.00	22.00
Steel punchings, lb.	0.02		0.02	0.02
Counterweight concrete, cu.yd.	20.00		20.00	20.00
Counterweight mortar, cu.ft.	1.00		1.00	1.00



Westward view of Chicago Outer Drive improvement

Current Construction Unit Prices

Wharf Extension at Richmond, Va.

A MUNICIPAL wharf extension to cost $68,910 was placed under contract in May, 1931, by the city of Richmond, Va. Bids were received May 4 on two schemes: (1) plain concrete gravity-type wall 215 ft. long by 38 ft. high, and timber wharf in two sections totaling 300 ft.; (2) reinforced-concrete platform on concrete piles, as alternate

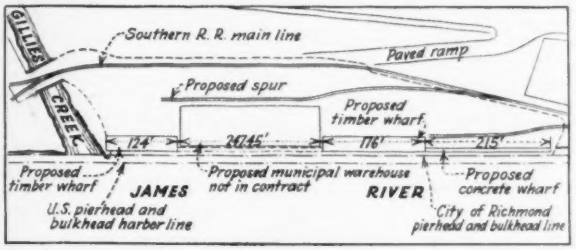


Fig. 1—Location plan of Richmond wharf extension

to the gravity section, and the same timber construction. As the city furnishes cement at the site, this item is not included in the unit prices. Low bids on both plans were submitted by A. H. Calligan & Co., and contract was awarded on plan 2. Total bids were as follows:

	Plan 1	Plan 2
A. H. Calligan & Co.	$76,743	$55,118
City's part, cement	12,795	4,797
Plus 15 per cent	13,442	8,995
Total	102,980	68,910
Engineer's estimate	124,600	81,600

Fig. 1 is a location plan of the work. Fig. 2 shows the type of construction under the two plans. An interesting feature is that a ledge of hard granite makes pile penetration impossible, and drilling is necessary.

The reason for the combination timber and concrete construction is the fact that the city department of public works has been considering for some time the relative advantages of alongside wharf or of slip construction. As no decision has been reached, the timber section will close in the gaps which may eventually be the mouths of slips.

The James River at Richmond usually floods twice a year, and at such times averages 10 ft. above mean sea level; the level of the wharf proper is therefore established at 12 ft. above. Occasional floods reach 20 ft. above m.s.l., which accounts for the great height of the fender piles. The wharf wall is constructed so that its elevation may be raised 4 ft.

Nine bids were received on plan 1 and eleven bids on plan 2. Unit prices are given of the lowest three bidders on each: A, A. H. Calligan & Co., Builders Exchange, low on both plans; B, Longley & Co., second on plan 1; C, Newport Construction Co., second on plan 2; D, Merritt-Chapman & Scott, third on plan 1; E, Carpenter & Petrie, Inc., third on plan 2. James Bolton is chief of bureau of surveys and design.

TABLE I—GRAVITY WALL AND TIMBER WHARF

	A	B	D
6,400 cu.yd. earth excavation	$3.30	$2.00	$3.15
1,100 cu.yd. rock excavation	4.68	6.00	3.15
50 cu.yd. rock below El. —26	4.00	10.00	3.15
27 lin.ft. drilling holes (fender cluster piles)	54.00	60.00	50.00
240 lin.ft. drilling	14.58	20.00	12.00
5,800 cu.yd. plain concrete	4.67	7.00	7.00
1,350 lin.ft. 50-ft. creo. piles	0.76	1.10	0.90
1,200 lin.ft. 40-ft. creo. piles	0.72	1.10	0.90
1,080 lin.ft. 35-ft. creo. piles	0.72	1.00	0.90
3,200 lin.ft. 30-ft. creo. piles	0.72	1.00	1.00
250 lin.ft. 25-ft. creo. piles	0.75	1.20	1.00
320 lin.ft. 40-ft. untreated	0.70	1.20	0.60
115 M.ft. b.m. creosoted pine	92.14	75.00	95.00
23 M.ft. b.m. white oak 4x10s	51.50	50.00	90.00
6,800 lb. miscellaneous steel	0.12	0.07	0.08
4,200 lb. miscellaneous cast iron	0.06	0.15	0.05
50 cu.yd. sta. overhaul	0.01	0.20	0.05
Total	$76,743	$85,580	$89,273

TABLE II—CONCRETE PLATFORM AND PILE WALL AND TIMBER WHARF

(Contract Awarded on This)

	A	C	E
3,700 cu.yd. uncl. excavation	$0.84	$0.90	$0.80
Drilling Holes for Piles:			
40 ft. for fender piles	10.80	12.00	11.67
225 ft. for concrete pile A	9.72	11.00	10.50
145 ft. for B, 24x24	15.12	17.00	16.35
440 ft. in earth for B, 24x24	8.64	10.00	9.60
30 ft. for B, 20x20	9.72	11.00	10.50
85 ft. in earth for B, 20x20	7.56	9.00	8.17
40 ft. for E	9.72	11.00	10.50
460 ft. in earth for E	7.56	9.00	8.17
240 ft. for timber piles	5.40	6.00	6.60
375 cu.yd. plain concrete	6.32	12.00	8.47
510 cu.yd. reinforced concrete	6.55	15.00	12.20
1,100 lb. miscellaneous cast iron	0.06	0.05	0.07
1,080 ft. concrete piles, 24x24	3.28	3.60	5.48
2,460 ft. concrete piles, 20x20	2.69	3.10	5.20
2,550 ft. 50-ft. creosoted piles	0.76	0.70	0.93
1,200 ft. 40-ft. creosoted piles	0.72	0.70	0.82
350 ft. 35-ft. creosoted piles	0.72	0.80	0.85
3,200 ft. 30-ft. creosoted piles	0.72	0.85	0.89
250 ft. 25-ft. creosoted piles	0.75	1.00	0.99
600 ft. 40-ft. untreated piles	0.70	1.00	0.60
1,185 M.ft. b.m. creosoted pine	92.14	100.00	106.09
23 M.ft. b.m. white oak	51.50	80.00	69.50
67,400 lb. reinforced steel in place	0.035	0.04	0.04
7,800 lb. miscellaneous steel in place	0.12	0.09	0.097
50 cu.yd. sta. overhaul	0.01	0.02	0.02
Total	$55,118	$67,548	$72,074

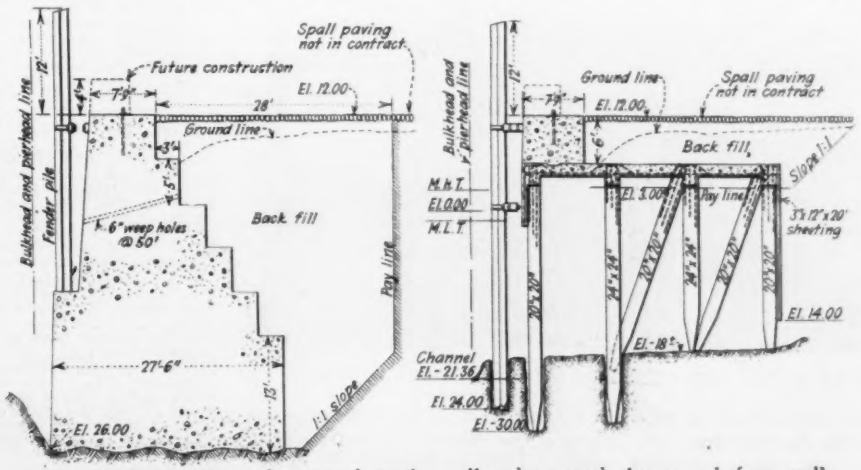


Fig. 2—Cross-sections of proposed gravity wall and accepted alternate platform wall

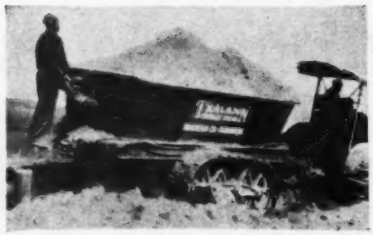
Railway Utility Crane

(Continued from p. 33)

100-ton combination steam locomotive cranes and piledrivers have been built by the Browning Crane & Shovel Co., Cleveland, Ohio, for service on the Canadian Pacific Railway. One of these units can pick up a load of 10 tons at a 40-ft. radius, or up to 40 tons at a smaller radius. The folding piledriver leads with which each crane is equipped are fitted with a 6,700-lb. steam hammer capable of striking a blow of 8,200 lb. and of driving large piles up to 30 ft. in length. Fitted with appropriate buckets, it is suited for material handling, dragline grade work and snow removal. Notwithstanding their great weight, the cranes are flexible and mobile, developing a speed up to 15 m.p.h. and power to pull several loaded freight cars at about half that speed. Many changes and improvements were suggested by the motor power and rolling stock department of the Canadian Pacific Railway, including a special lubricating system; disengaging mechanism for the travel gears; heating provision for tender during severe weather; oversize boilers to assure sufficient steam for all operations, even when carried on simultaneously; electric light generator and floodlights for night operation; and provision for the use of an extra generator to supply an electromagnet.

All-Steel 7-Yd. Crawler Wagon

What is said to be the strongest and lightest crawler wagon of 7-cu.yd. capacity, weighing only 8,800 lb. complete, has been introduced by the Trackson Co., Milwaukee, Wis. It is built entirely of steel, with special reinforcement at points subject to great wear and strain. At the front and rear ends, for instance, are box-shaped cast-steel headers. Extra-heavy 8-in. pipe provides a straight, tubular tongue which is clamped between the two front header castings. The tongue leads at an angle direct from the front header of the wagon to the tractor drawbar. Inclosed



Crawler wagon of 7-cu.yd. capacity

in its end is the drawbar spring assembly, a unit in itself, which can be removed for repairs by simply removing two bolts. In the head are two holes, the lower for use when connecting the tractor, the upper for connecting to another wagon in tandem formation. The drawhead swivel takes care of motion in all directions.

Without the flareboard, which can easily be removed or bolted on, the wagon has a loading height of only 61½ in. Its wide doors, straight ends and small side flare enable it to unload quickly. Bottom clearance is 26 in. A single lever is used for both dumping the load and winding up the doors, which are made of ⅜-in. steel plate, flanged and reinforced with angles. A cable equalizer keeps both doors shut tight.

The wagon is equipped with Trackson 15-ton crawler wheels, which were described in detail in our issue of April 30, 1931, p. 750.

New Publications

Pumps—Single-stage split casing centrifugal pumps form the subject of a 34-p. illustrated bulletin 315 prepared by the BYRON JACKSON CO., Berkeley, Calif. This describes the type S units of this company, gives complete specifications for proper selection of sizes, and contains considerable hydraulic data.

Cranes and Shovels—Specifications, illustrations and working diagrams relating to the crawler-mounted convertible tractor shovel and the rubber tire mounted Cranemobile are given in catalog T-7 of BAY CITY SHOVELS, INC., Bay City, Mich.

Lime Mortar—NATIONAL LIME ASSOCIATION, 927 Fifteenth St. N.W., Washington, D. C., has prepared a 36-p. illustrated brochure "Lime Mortar—Its Relation to Watertight Masonry," which directs attention to the problem of leaky masonry and suggests a means of avoiding similar conditions in future construction.

Water Treatment—Research publication 305 of the WALLACE & TIERNAN CO., INC., Newark, N. J., discusses the ammonia chlorine process and its application in the treatment of water.

Belt Conveyors—The successful use of belt conveyors on a variety of concrete construction jobs is described and illustrated in "Concrete Handling," a new 44-p. book printed and made available through the BARBER-GREENE CO., Aurora, Ill. Besides the job descriptions, this book contains specification data on Barber-Greene concrete conveyors.

Stainless Alloy Steels—Five manufacturing subsidiaries of the UNITED STATES STEEL CORP. have compiled a 36-p. illustrated treatise on stainless and heat-resisting chromium and chromium-nickel alloy steels for architectural and industrial uses. Separate chapters describe five of these alloys, giving data on composition, physical properties, corrosion resistance, metallurgical nature and recommended procedure for forging, annealing, welding, riveting and other mechanical operations. Copies of the book may be obtained from any of the following: American Sheet & Tin Plate Co., Carnegie Steel Co., and National Tube Co., Pittsburgh, Pa.; American Steel & Wire Co., and Illinois Steel Co., Chicago, Ill. These companies have also issued a shorter summary of the same data in the form of an article, "Filling Their Niche," by R. E. Zimmerman, which is published in the form of a 4-p. leaflet.

Conduit—For the purpose of inquiring into the experience which has attended the use of rigid conduit as a protective electrical raceway, the Electrical Testing Laboratories, New York City, has prepared a critical history of the development of rigid conduit which has been published by the trade extension committee of the rigid conduit section of the NATIONAL ELECTRICAL MANUFACTURERE ASSOCIATION. Copies may be obtained from George H. Sicard, secretary, 603 Gas & Electric Building, Utica, N. Y.

Pumps—Recent publications of the WORTHINGTON PUMP & MACHINERY CORP., Harrison, N. J., include bulletins and specification sheets on the following types of pumps: horizontal duplex piston; horizontal triplex single-acting power; horizontal duplex double-plunger power; single- and multi-stage centrifugal; and horizontal duplex double-plunger steam.

Pipe—Spiral welded pipe forms the subject of an 8-p. bulletin of the CALIFORNIA CORRUGATED CULVERT CO., Berkeley, Calif.

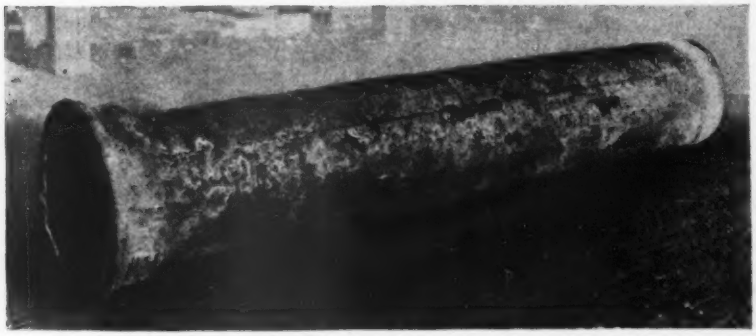
Flexible Couplings—A small all-steel coupling in which flexibility is secured through design rather than from the use of flexible materials is described in Bulletin 40 of the MORSE CHAIN CO., Ithaca, N. Y.

Excavators—Specifications and details of construction of the Bucyrus-Erie 37-B 1¼- to 1½-cu.yd. shovel-dragline-clamshell-lifting crane are given in a 24-p. bulletin published by the BUCYRUS-ERIE CO., South Milwaukee, Wis.

Motor Trucks—Construction operations served by International motor trucks are illustrated and described in a revised edition of the publication "On Jobs Like These," prepared by the INTERNATIONAL HARVESTER CO., 606 South Michigan Ave., Chicago, Ill.

Steel Flooring—Type F steel grating, designed to fill the demand for a strong, inexpensive and lightweight open steel flooring and type M bridge and floor slabs, for installations requiring considerable strength and resistance to impact, as well as other types of steel flooring and floor armoring, are described in a 20-p. catalog published by the KERLOW STEEL FLOORING CO., 220 Culver Ave., Jersey City, N. J.

Pipe and Culvert—Recent publications of the ARMCO CULVERT MFGRS. ASSN., Middletown, Ohio, include four bulletins on the selection, installation and use of culverts and corrugated iron pipe in a number of fields. These contain photographs of actual jobs, blueprints, sketches, formulas and engineering data. The subjects covered include paved invert pipe for balanced design; culvert installations in various fields; storm sewers for draining business and residential sections; and perforated pipe for draining wet cuts, frost boils, soft spots and large open areas such as athletic fields and airports.



WATER PIPE SERVICEABLE AFTER 112 YEARS

Excavation for the South Broad St. subway in Philadelphia, Pa., uncovered this piece of cast-iron pipe which was laid, according to water department records, in the year 1819. It was installed as part of a system begun in 1817, much of which is still in service. No defects could be found in the pipe section.

Business Side of Construction

In First Half-Year Public Work Up 8 Per Cent, Private Lower

Contracts awarded in the first half of the year totaled 1,394 millions of dollars, compared with 1,850 millions last year, a drop of 25 per cent. Volume of private work is about half that of last year; public work is 8 per cent above last year's volume. Values of the principal classes are given as percentages of their 1930 values: waterworks, 135 per cent; sewers, 90; bridges, 94; roads, 106; buildings, 54; federal government, 285.

Two sections of the country have recorded a larger volume than last year: the South and the Far West. The total for the South is 146 millions, against 144 in the first half of 1930; Far West, 182 and 167 respectively. Conditions in the other regions are shown as percentages of last year's volume: New England, 79 per cent; Middle Atlantic, 62; Middle West, 75; Mississippi to mountains, 82.

June total was 196 millions, compared with 302 in June, 1930. Increased or equal values were recorded in waterworks, sewers and federal government work. There were moderate gains in New England and the Far West.

Building Wage Scales Not Holding

Wage cutting in construction trades was probably more extensive and severe in June than at any time since the depression of 1921.

On public projects there is widespread effort to hold the local scale or at least to write an agreed minimum into the contract. Several instances were reported in June of contractors who were threatened with severe penalties for violation of the wage stipulation. On private projects, contractors are rapidly breaking down the old schedules in cases where they are not bound by signed agreements with the union. Official and actual wages of 54 cities were given in *Engineering News-Record*, June 4, 11 and 18, pp. 946, 990, and 1028.

Unemployment in the building trades remained at 48 per cent throughout May and June, compared with 37 per cent a year ago and 19 per cent in 1929. Reports on local conditions follow:

Albany—A record total of 18,000 men are now employed on state highway construction, compared with only 10,000 last year. From Jan. 1 to June 15, 119 miles of road was built, compared with 96 miles in the same period last year.

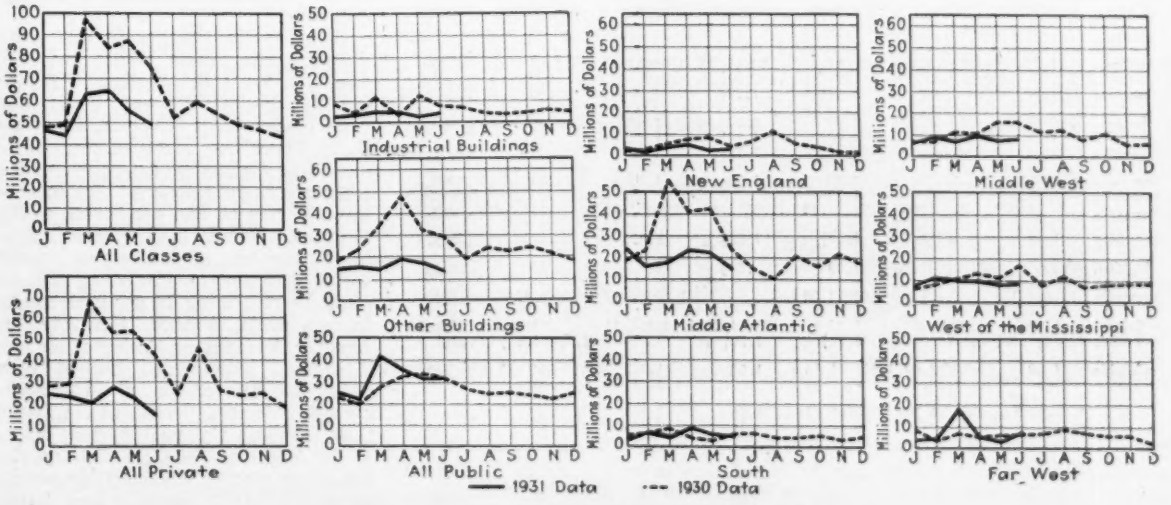
Syracuse—Contract for grading school grounds awarded under condition that contractor will employ local workers and substitute hand labor for machinery.

New York—Fund of $2,000,000 voted June 5 to continue emergency employment for 14,562 men, who were put to work in various municipal departments during the last week in April and the first week in May. Bonds will be issued to cover the amount, which is deemed

ENGINEERING CONSTRUCTION CONTRACTS REPORTED IN JUNE, 1931

Thousands of Dollars (000 omitted)

	New England	Middle Atlantic	South	Middle West	West of Mississippi	Far West	United States June, 1931	United States Six Months 1931	United States Six Months 1930	Canada, June, 1931
Waterworks	$219	$1,197	$1,178	$616	$552	$4,254	$8,016	$34,566	$25,791	$133
Sewers	265	2,429	115	452	870	1,239	5,370	35,773	40,278	44
Bridges, public	402	1,281	263	1,283	1,028	1,529	5,786	51,160	55,319	180
Excavations	121	69	69	368	98	694	1,419	12,558	10,944	173
Streets and roads	2,312	13,371	11,375	15,421	12,679	7,313	62,471	336,951	313,767	1,191
Federal government	851	5,513	2,962	1,273	6,081	3,478	20,158	148,259	52,383	.....
Unclassified, public	289	2,368	55	372	614	267	3,965	49,615	70,684	64
Buildings, public	5,077	5,129	448	4,067	1,616	2,215	18,552	124,263	163,289	775
Total public	9,536	31,357	16,465	23,852	23,538	20,989	125,737	793,145	732,455	2,560
Buildings, industrial	1,160	6,105	390	4,234	1,657	355	13,901	94,292	200,482	311
Buildings, commercial	4,005	24,811	1,200	4,925	5,720	325	40,986	313,719	605,965	1,607
Bridges, private	25	.....	.....	.....	.....	.....	25	6,578	6,322	162
Unclassified, private	125	1,990	2,500	282	2,937	7,843	15,677	186,413	305,599	1,029
Total private	5,315	32,906	4,090	9,441	10,314	8,523	70,589	601,002	1,118,368	3,109
June total, 4 weeks	**14,851**	**64,263**	**20,555**	**33,293**	**33,852**	**29,512**	**196,326**	.....	.....	**5,669**
May, 1931, 4 weeks	15,817	93,932	23,381	34,055	35,271	15,377	217,833	.....	.....	6,893
June, 1930, 4 weeks	15,641	97,999	30,919	61,023	70,896	25,702	302,180	.....	.....	13,318
Six months, 1931	94,507	526,659	145,810	217,546	227,393	182,232	.....	1,394,147	.....	58,671
Six months, 1930	121,024	852,364	143,718	289,169	277,093	167,455	.....	.....	1,850,823	87,111



Contracts awarded, showing trend by classes and sections

necessary to provide relief at least for the summer months. The Brooklyn Edison Co. on June 23 authorized an appropriation of $5,000,000 to continue removal of overhead distribution lines as a means of retaining 1,500 construction workers who otherwise would have faced a layoff before August.

Newark — Conference held June 12 between union, contractors, owners and city in effort to reach settlement of strike on Prudential housing project, begun March 6 and still remaining unsettled. Carpenters returned to work June 1, after nation-wide strike on jobs of Starrett Bros. & Eken, which lasted four weeks.

Fort Lee—State furnished sixteen trucks June 18 for supplying building materials to contractors on approach highways to the George Washington bridge at Fort Lee. The employment of state trucks was necessitated by a strike of materials handlers who moved in sympathy with action of carpenters and ironworkers against open shop and payment of wages below scale. Strike ended June 23, with contractors agreeing to pay scale of $16 a day to ironworkers, $12 to carpenters, $13.50 to dock builders and 45c. to 50c. an hour to common laborers. The common laborers lost, in that they had demanded 75c.

Baltimore—Grand jury during June resumed investigation of cases where it is alleged that contractors on municipal work paid laborers below current minimum wage.

Washington, D. C.—Total number of persons employed on federal construction projects as of June, 1931, reached 655,000, compared with the preceding enumeration of 425,000 in October, 1930, and the one before that, of 235,000 in January, 1930. It is estimated that 805,000 will be working in this class by September, 1931, an increase of 22.9 per cent over the June level.

Pittsburgh—Strike of structural ironworkers' local began June 1 over demand for $1.65 per hour and five-day week, instead of $1.50 and 5½ days. The ironworkers demanded also the work of handling steel between trucks and the buildings, some of which had been done by common laborers. The strike ended June 20, with contractors agreeing to use union men exclusively at regular scale.

Cincinnati — New ruling passed whereby county commissioners are permitted to specify in contracts that a wage minimum of 40c. per hour be observed, regardless of offers from laborers to work for less. One contractor, on water-line projects, has been arraigned for violation of the rule. While his wage list averaged 40c., five laborers had received less than the stated amount.

Mansfield—A wage cut of 5 per cent, effective June 7, has been voluntarily accepted by 1,600 employees of the Empire Steel Corporation. Reduction is designed to help the steel company, now in receivership. A wage cut of 16 per cent was rescinded May 15, after the steelworkers had gone on strike.

Youngstown—An order for 41,000 tons of line pipe will enable local plants to reemploy 1,000 men. Moreover, employment for the men is practically assured for the remainder of the summer, owing to prospective tonnages in bars as well as pipe.

Chicago—Several hundred additional men will receive employment when 10,690 tons of water mains, on which contracts were let in June, are laid.

Detroit—Payment on school board projects of wages below rate prescribed in contract will henceforth draw a double penalty from contractors and subcontractors who violate the rule. The amount thus saved by the contractor must be refunded to the board, and he is to be barred from again submitting bids on school work.

Minneapolis — Proposed sewage-disposal plant to provide work for 1,000 more men between now and winter.

Birmingham — Municipal projects, which form the bulk of present contracts, are going forward under open-shop conditions. Certain of the skilled groups offer to work below scale for specified periods, ranging from three to six months, wth the stipulation that employers return to regular rates at expiration of that time.

Denver—City pays minimum of 50c. per hour for common laborers. Contracts are voided when it is established that contractor pays under 50c. Private jobs carry rates as low as 30c.

Las Vegas—Director of state employment bureau reports spurious advertisements, in Eastern states, purporting to push applications for work on Hoover Dam for fees as low as $1. There are already 3,800 applications on file at Las Vegas, with 1,200 men awaiting work, according to reports received by the director general of the employment service at Washington.

Toronto—In spite of objection of employers, agreement signed in 1930 with plumbers and steamfitters found valid and enforceable until April 30, 1932.

Wage Rates—The average hourly rate for skilled building trades mechanics is $1.23, compared with $1.36 in June and $1.38 in July, 1930. The national average for common labor is 47.21c. per hour, compared with 63.94c. in June and 56.15c. in July, 1930.

CURRENT BUILDING AND CONSTRUCTION TRADES WAGE RATES PER HOUR

Advances since last month are indicated by **heavy type**, declines by *italics*

Cities	Bricklayers	Carpenters	Hoisting Engineers	Pile Drivers	Structural Iron Workers	Masons' Laborers	Common Laborers
Atlanta	*$1.12½*	*$0.40@.60*	$0.60@1.00	.....	$0.75@1.25	$0.20	*$0.15@.20*
Baltimore	1.75	1.00@1.10	1.00@1.37½	$0.65	1.00@1.25	1.00	.30
Birmingham	*.80*	*.55*	*.85*	.....	*.85*	.30	.25
Boston	1.50	1.37½	1.37½	1.27½	1.37½	.85	.40@.80
Cincinnati	*.90@1.25*	*.50@1.00*	*1.00*	*1.00*	*1.00*	*.40*	*.25@.40*
Chicago	1.70	1.62½	1.62½	1.62½	1.62½	.97½	.97½
Cleveland	*1.25@1.50*	*.85@1.10*	1.37½	1.10	1.50	*.50*	*.40@.50*
Dallas	*1.62½*	1.12½	1.25	1.25	1.25	*.35*	*.25@.35*
Denver	1.50	1.25	1.25	.....	1.25	*.50*	*.30@.50*
Detroit	*1.25@1.50*	*.80@1.00*	1.00@1.10	1.00@1.10	1.00@1.25	*.50*	*.35@.50*
Kansas City	1.50	1.37½	1.37½	1.37½	*1.37½*	*.82½*	.25@.75
Los Angeles	1.37½	.87½@1.00	1.00	.87½	1.12½	.75	.50
Minneapolis	*1.12½@1.37½*	*.87½*	.90@1.00	.....	1.00@1.25	*.50@.65*	*.40*
New Orleans	1.00	.50@.75	1.25	.80@1.00	1.12½@1.25	.75	.20@.35
New York	*1.75@1.92½*	*1.50@1.65*	1.92½	1.78½	1.92½	*1.00@1.03½*	*.65@.93¾*
Philadelphia	*1.50*	*.90@1.00*	1.02½@1.36	1.00	1.37½	*.40*	.40
Pittsburgh	*.70@1.75*	*.70@1.50*	*.70@1.50*	.....	*.70@1.50*	*.50*	*.50*
St. Louis	*1.25@1.75*	*1.00@1.50*	1.60@1.75	1.25	1.75	*.87½*	.30@.87½
San Francisco	1.37½	1.12½	1.12½	1.12½	1.37½	.87½	.68¾
Seattle	*87½@1.50*	*.62½@1.12½*	1.12½@1.25	*1.12½@1.25*	*1.12½@1.25*	*.70*	*.50@.70*
Average	*1.38*	*1.01*	*1.17*	*1.17*	*1.28*	*0.6420*	*0.472*[1]
Montreal	1.12½	.75	.70	.90	.75	.35	.35

Notes on Materials Prices

Steel—Sheet makers ask advances of $1 to $5 a ton on all grades for third-quarter deliveries. They will probably not be paid. Wire nails are up 5c. per keg, to $2.40 delivered St. Louis. Bars, shapes and plates were reduced substantially at Chicago warehouses during June. Dealers in San Francisco, Cleveland and Dallas also made slight reductions in deliveries from warehouse stock. Mill prices unchanged throughout June.

Cement—No changes in mill prices during June. New York's price for five truckloads delivered is $1.95 per barrel, a drop of 5c. from June 1. Concrete blocks down 1c. at St. Louis and 2c. at Brooklyn. Manufacturers of cement, like the lumbermen, ask protection against foreign shippers. An increase in tariff rate of 13c. per barrel, to 36c. is urged. Denmark at present is sending 61 per cent of our cement imports, while Belgium is furnishing 29 per cent, the remaining 10 per cent coming from Canada, France, Germany and Japan. Governor of Michigan on June 8 ordered state-owned cement plant closed and offered for sale, plant having lost $600,000. Plants of the Pacific Coast Cement Co. were leased June 3 to the Superior Portland Cement Co., Inc., thus placing 2,800,000 bbl. of capacity (1,700,000 Superior and 1,100,000 Pacific) under one management.

Lumber—The regular Fourth of July shutdown will serve as a temporary brake in the normal excess of production over demand which is encountered in the warm months of the year. Orders are greater than production in North Carolina pine, Southern and Eastern hardwood areas. A few advances appear, for a change, in lumber prices for the first of the month. Denver market is up on 8-in. hemlock and 2-in. and 8-in. fir; Birmingham on and 2- and 3-in. pine; in Baltimore, on 8-in. spruce; in Detroit, on 1- and 2-in. pine and fir. New York wholesalers advanced pine $1 per 1,000 ft., but stocks were up to 130,000,000 ft. at the retail yards and this quantity was too heavy to warrant a price move by dealers. Much has been said about small mills cluttering the market with a continuous supply of odd lots, which prove burdensome in the aggregate. Now curtailment is being observed more severely among the small mills, at least in Southern pine territory, than among the larger plants. In the May accounting 184 small mills produced only 91,000,000 ft., compared with 317,000,000 ft. for 142 large mills. At the same time 54 mills shut down completely, while but seventeen of the large mills ceased operations. The result is that stocks of the small mills were short 45 days' supply, as measured by standards established under favorable conditions, while there was an oversupply at the large mills equal to 25 days' production. Representative manufacturers from all sections are pressing the government to effect certain modifications in existing anti-trust laws, to enable them to control production. Further protective measures than that afforded by a tariff of $1 per 1,000 ff. are deemed necessary by the manufacturers in order to prevent complete demoralization of the domestic lumber market as the result of Russian dumping.

Brick—Rate of consumption in New York June 1 approximately 16,000,000 per week, an increase of 16 per cent over that of the same period last year. Slight decrease in demand has appeared since, with prices at New York down 50c. per 1,000, to $13, delivered. Dealers at Baltimore reduced prices 50c. per 1,000, to $12.50, and in Los Angeles $1, to $12. Freight rates on brick in carloads from Pennsylvania and New Jersey plants to New York were reduced in June by the Interstate Commerce Commission, after having been under consideration since October, 1930.

Brickmakers have stressed the point that lighterage and floatage costs involved in getting brick across the Hudson River from Jersey City to New York ran as high as $1 a ton in certain cases. The new order reduces this charge to a maximum of 50c., thus placing on a more competitive basis rail-float shipments across the river and barge shipments down the river.

Crushed Stone—Dealers at Los Angeles advanced sand 20c. per ton, to $1.50 and $1.70, and crushed stone and gravel 30c., to $2.20. As a measure of economy, Spokane County, Wash., threatens to erect its own stone-crushing plant because of prohibitive prices of stone for road work.

Lime—Hydrated finishing grade down $3 per ton, to $18, delivered New York. In Los Angeles hydrated common advanced $2, to $18.

Granite Blocks—Five-inch paving blocks are off $30 per 1,000, to $120, f.o.b. New York, in transactions running as high as 50,000 blocks.

Cast-Iron Pipe—A sufficiently large volume of new lettings is in view to keep foundry operations at 50 to 60 per cent until after the first week in July. About 57 per cent of the cast-iron pipe now being produced is going to industrial users. Prices held steadily throughout June.

Expanded Metal Lath—Declines occurred in New York; but prices in Birmingham and St. Louis advanced slightly. Triangle mesh was sold at prices 10 per cent under May schedules in Chicago district.

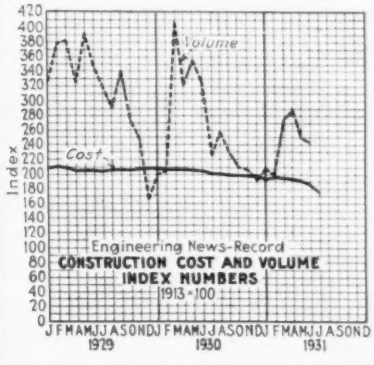
Prepared Roofings — Composition shingles advanced 25c. to 38c. per square at dealers' warehouses in New York, due to dwelling house demand.

Railway Ties—Oak, pine and cypress advanced 5c. on 7-in. in St. Louis area, owing to railway repair requirements.

Asphalt—Paving grade in bulk rose $2 per ton, to $14, f.o.b. Birmingham; packages up $1 per ton, to $20.50, at St. Louis, as a result of activity in road-building and street repair.

Construction Cost and Volume Index Numbers

Cost index is lowest since August, 1922, at which time the number stood at 173.40. The current index of 174.37 is 6.8 per cent under that of June and 13.2 per cent below that of July, 1930. June volume was 3.1 per cent under that of May and 25 per cent below that of June, 1930.



E. N.-R. Cost		E. N.-R. Volume	
July, 1931	**174.37**	**June, 1931**	**243**
June, 1931	187.37	May, 1931	251
July, 1930	200.95	June, 1930	324
1930 (average)	202.85	1930 (average)	260
1929 (average)	207.02	1929 (average)	317
1913 (average)	100.00		
1930		1930	
January	208.96	January	199
February	206.46	February	204
March	206.80	March	408
April	207.12	April	320
May	205.86	May	354
June	203.36	June	324
July	200.95	July	226
August	200.95	August	259
September	199.58	September	232
October	198.72	October	211
November	198.54	November	207
December	196.86	December	192
1931		1931	
January	194.48	January	208
February	196.61	February	198
March	194.51	March	278
April	191.63	April	289
May	189.33	May	251
June	187.23	June	243
July	174.37		

Capital and Contracts

New capital issues of the last week in June totaled 166 millions, or more than the total of the preceding three weeks of that month. The increase was due to a large number of private issues, aggregating 147 millions. The largest three were: Detroit Edison Co. 4½s, $15,000,000; Wisconsin-Michigan Power Co. 4½s, $5,000,000; Jersey Central Power & Light Co. 4½s, $32,000,000. Public issues totaled only 19 millions and included four fairly large issues: State of Minnesota 3¼s, $8,600,000 highway; Providence (R. I.) 4s, $2,000,000, school and paving; Los Angeles County School District 4s, $2,000,000 schools; State of Maine 3½s, $2,000,000, highway and bridge.

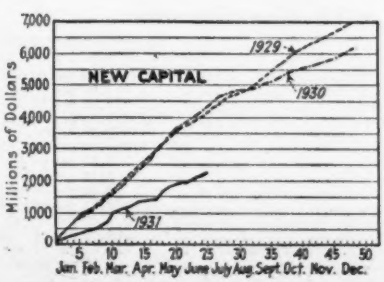
This week's contracts with comparisons are given below:

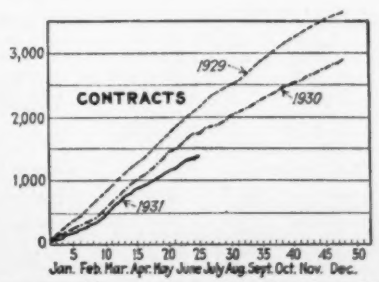
(In Thousands of Dollars)

	July 2, 1931	Average of Last Four Weeks 1931	Average of Last Four Weeks 1930
Buildings:			
Industrial	$2,431	$1,903	$7,764
Other	22,830	15,382	32,727
Streets and roads	6,783	13,828	14,256
Other eng. constr.	7,832	11,885	10,043
Total	$39,876	$42,999	$64,791

Total, all classes, Jan. 1 to July 2:

1931	$1,434,023
1930	1,905,125





Current Prices of Construction Materials

Price advances since last month are indicated by **heavy type**; declines by *italics*

Building Materials

PORTLAND CEMENT—Prices per barrel, for cement in cloth, *without including charge for four bags at 10c. each.* Cash discount not deducted. Prices are delivered by truck to contractors at site of job:

	July 2, 1931	One Mo. Ago	One Yr. Ago
Atlanta	*$2.15*	$2.35	$2.34
Baltimore	1.75	1.75	2.60
Birmingham	2.30	1.46	2.60
Boston	2.20	2.20	2.50
Chicago	1.95	1.95	2.20
Cincinnati	1.60	1.60	2.94
Cleveland	1.40	1.40	2.80
Dallas	1.88	1.88	2.15
Denver	2.15	2.15	2.61
Detroit	2.08	2.08	2.60
Jersey City	2.04	2.09	2.60
Kansas City	1.48@2.15	1.48@2.15	2.65
Los Angeles	2.10	1.92	1.92
Minneapolis	2.15	2.05	2.50
Montreal	2.18	2.18	2.20
New Orleans	1.95	1.95	2.65
New York	*1.53@1.95*	1.85@2.00	2.15@2.20
Philadelphia	2.00	2.00	2.10
Pittsburgh	1.81	1.76	.....
St. Louis	1.85	1.85	2.45
San Francisco	2.34	2.34	2.64
Seattle	1.70	1.70	2.70

Current mill-prices per barrel, in carloads, without bags, f.o.b.:

Alpena, Mich	$1.30	Mason City, Ia	$1.10
Buffington, Ind	1.10	Norfolk, Va	1.71
Hannibal, Mo	1.10	Northampton, Pa	1.21
Houston, Tex	1.94	North Birmingham, Ala	1.41
Hudson, N. Y	1.31	Richard City, Tenn	1.41
Ironton, Ohio	1.06	Steelton, Minn	1.61
Iola, Kan	1.10	Universal, Pa	1.21
La Salle, Ill	1.10	Wyandotte, Mich	1.30
Limedale, Ind	1.20		

SAND AND GRAVEL—Per ton, delivered by dealers. Gravel, sizes ¾-in. or 1½-in. Weight of either, 3,000 lb. per cu. yd., unless otherwise specified:

	Gravel	Sand
Atlanta	$3.25	$2.50
Baltimore	2.55	2.08
Birmingham, per cu.yd., 2,600 lb	*flag used*	2.25
Boston	1.60@1.75	.90@1.15
Chicago, per cu.yd	2.00	2.00
Cincinnati	1.50	1.25
Cleveland, per cu.yd., 3,000 lb	2.60	2.50
Dallas, per cu.yd., 2,750 lb	3.00	2.50
Denver, per cu.yd., 2,700 lb	1.95	1.35
Detroit	*1.85*	*1.65*
Kansas City	.....	.....
Los Angeles	**2.20**	**1.50@1.70**
Minneapolis, per cu.yd., 2,800 lb	1.70@2.40	1.00
Montreal	1.50	1.25
New Orleans, per cu.yd., 2,700 lb	2.95	1.80
New York, per cu.yd.; gravel, 2,800@3,000 lb.; sand, 2,700 lb	3.00	2.00
Philadelphia	2.35@3.20	1.55@2.40
Pittsburgh	1.55	1.75
St. Louis	1.40@1.55	1.00@1.20
San Francisco	1.75	1.75
Seattle, per cu.yd., 3,200 lb	1.85	1.85

CRUSHED STONE—Per ton, sizes, ¾-in. or 1½-in., limestone, delivered by dealers. Weight, 3,000 lb. per cu.yd., unless otherwise specified:

Atlanta	$3.25
Baltimore	2.80
Birmingham	*flag used*
Boston	1.90@2.00
Chicago, per cu.yd., 2,500 lb	2.00
Cincinnati	2.25
Cleveland	2.60
Dallas, per cu.yd., 2,500 lb	3.25
Denver, granite, per cu.yd., 2,700 lb	2.50
Detroit	2.00
Kansas City	2.00
Los Angeles	**2.20**
Minneapolis, per cu.yd., 2,600 lb	2.40
Montreal	2.00
New York, per cu.yd	3.00
Philadelphia	2.30@3.15
Pittsburgh	3.25
St. Louis	1.40@1.45
San Francisco, trap rock	1.65
Seattle, per cu.yd., 2,700 lb	3.00

CRUSHED SLAG—Prices for carloads, per net ton, at plant:

	1½-In.	¾-In.	Roofing	Sand
Birmingham, Ala	$0.90	$1.15	$2.05	$0.55
Buffalo District	1.25	1.35	2.25	1.25
Cleveland, Ohio	1.10	1.10	....	1.30
Western Pennsylvania	1.25	1.25	2.00	1.25
Toledo, Ohio	1.10	1.10	1.10	1.00
Youngstown District	1.25	1.35	2.00	1.25

CONCRETE BLOCKS—Standard, 8x8x16-in., hollow, delivered to job, each:

Birmingham	$0.084	Kansas City	$0.18
Boston	.16@.20	Minneapolis	.11
Brooklyn and Queens	.12	New Orleans	.20
Cleveland	.16@.17	Philadelphia	.18@.25
Denver	.22	Pittsburgh	.16@.22
Detroit	.12	St. Louis	*.14*

HOLLOW TILE—Building tile per block, delivered by dealers to contractors in lots of 2,000 pieces or over:

	4x12x12	6x12x12	8x12x12	10x12x12	12x12x12
Atlanta	$0.14	$0.18	$0.24	$0.30	$0.36
Baltimore	.105	.....	.20	.....	.26
Birmingham	.089	.122	.167	.219	.25
Boston	.082	.118	.152	.21	.35
Chicago	.068	.0935	.1275	.1647	.183
Cincinnati	.06815	.09485	.129	.165	.184
Cleveland	.048	.066	.09	.117	.13
Dallas	.0885	.1255	.1485	.251	.306
Denver	.0975	.135	.175	.2125	.25
Detroit	.08	.11	.145	.19	.215
Kansas City	.088	.11	.145	.19	.215
Los Angeles	**.09425**	**.134**	**.188**	**.2325**	**.3115**
Minneapolis	.0611	.081	.10605	.1302	.1737
New Orleans	*.06*	*.085*	*.12*	*.166*	*.20*
New York	*.075*	*.125*	*.14*	.....	.....
Perth Amboy, N. J.(f.o.b.)	.....	.....	.....	.2388	.2956
Philadelphia	.105	.14	.215	.28	.34
Pittsburgh	.0545	.0765	.1035	.135	.148
St. Louis	.075	.10	.14	.175	.21
San Francisco	.108	.156	.255	.....	.....
Seattle	.085	.115	.18	.....	.....

BRICK—Prices delivered by dealers per thousand, are as follows:

	Common	Face	Paving F.O.B. 3x8½x4-In.	Paving F.O.B. 3½x8½x4-In.
Atlanta	$11.25	$21.50	$42.00	$47.00
Baltimore	*12.50*	25.00	40.00	46.00
Birmingham	13.50	22.50	**29.50**	**29.50**
Boston	14.00	28.75	43.00	47.50
Chicago	12.00	.....	42.00	45.00
Cincinnati	16.00	24.00	35.00	37.00
Cleveland	12.00@14.00	21.00@28.00	33.00	36.00
Dallas	14.50	17.50	.....	29.50
Denver	9.00@10.00	25.00	.....	.....
Detroit	15.00	25.00	35.50	37.50
Kansas City	14.00	.....	35.00	37.50
Los Angeles	*12.00*	26.50	.....	.....
Minneapolis	10.50	30.00	.....	.....
Montreal	28.00	.....	.....	.....
New Orleans	*12.00*	.....	35.00	42.00
New York	*13.00*	*26.00*	45.00	50.00
Philadelphia	16.00	.....	40.00	45.00
Pittsburgh	16.00	22.00	41.00	58.00
St. Louis	12.00	22.00	35.00	35.00
San Francisco	14.00	.....	45.00*	.....
Seattle	14.00	.....	.....	48.50

*2½x8½x4-in.

LIME—Prices delivered by dealers to job:

	Hydrated, per Ton — Finishing	Hydrated, per Ton — Common	Lump, per Barrel — Finishing	Lump, per Barrel — Common
Atlanta	$20.00	$12.50	.....	$2.50†
Baltimore	22.00	14.00	.....	2.25†
Birmingham	30.00	17.50	.....	2.00†
Boston	22.00	14.50	$4.00*	3.10*
Chicago	15.00	14.50	15.00‡	15.00‡
Cincinnati	13.05	10.70	.....	.....
Cleveland	12.00	10.00	2.50†	2.50†
Dallas	20.00	.....	2.35†	.....
Denver	32.00	23.75	3.80*	3.00†
Detroit	14.00	12.00	1.75†	1.65*
Kansas City	19.00	18.00	2.20†	2.00†
Los Angeles	**26.00**	**18.00**	*2.00†*	*2.00†*
Minneapolis	25.50	21.00	.....	1.70†
Montreal	18.00	.....	10.00	.....
New Orleans	25.00	15.00	2.65†	1.95†
New York	*18.00*	15.50	4.10*	3.15*
Philadelphia	18.00	15.00	18.00‡	14.00‡
Pittsburgh	13.50	13.00	4.25*	2.75†
St. Louis	22.00	18.00	.....	15.00‡
San Francisco	20.00	20.00	.....	1.85†
Seattle, paper sacks	35.00	24.00	.....	2.80†

*Per 280-lb. bbl. (net). †Per 180-lb. (net). ‡Per ton.

LIMESTONE—Mill blocks, f.o.b. siding, per cu.ft.:

New York: Rustic buff, $1.42; Standard gray, $1.47; Standard, $1.57; Selected gray, $1.57; Selected buff, $1.67.
Boston: Rustic buff, $1.45; Standard, $1.58; Selected buff, $1.71.
Pittsburgh: Rustic buff, $1.03; Standard, $1.18; Selected buff, $1.28.

SLATE—Roofing, f.o.b. quarry, Bangor, Pa., net, per square:

No. 1 Clear	$9.00@$14.00
No. 1 Ribbon	7.50@ 10.25
Medium Clear	8.00@ 10.50

Road and Paving Materials

PAVING STONE—Carload lots of granite blocks, 4x8x4-in., dressed, f.o.b.:

Atlanta	$3.00 per sq.yd.
Baltimore	3.00 per sq.yd.
Boston	135.00 per M.
Chicago, 5 in.	3.25@3.90 per sq.yd.
Cincinnati	110.00 per M.
Cleveland	115@120 per M.
Detroit, 5 in.	3.00 per sq.yd.
Kansas City	3.75 per sq.yd.
Minneapolis, 4½ in.	2.80 per sq.yd.
Montreal	104.75 per M.
New Orleans	2.80 per sq.yd.
New York, 5 in.	*120.00* per M.
Philadelphia	125.00 per M.
St. Louis, 5 in.	3.50 per sq.yd.

Current Prices of Construction Materials

Road and Paving Materials—Continued

WOOD-BLOCK PAVING—Prices, f.o.b., in carloads:

	Size of Block	Treatment	Per Sq.Yd.
Atlanta	3½	16	$2.25
Boston	3½	16	2.25
Chicago	3½	12	1.80@2.00
Kansas City	3½	16	2.50
Minneapolis	3½	16	2.50
Montreal	3	16	2.63
New Orleans	3½	16	2.30
New York	3½	16	2.50
St. Louis	3½	16	2.10

FLAGGING—Alongside dock, New York: Manhattan and Bronx, 4 ft. wide, 24c. per sq.ft.; Queens, 5 ft. wide, 26c. per sq.ft.

CURBING—Prices per lin.ft., f.o.b., cutting charges not included:
New York: Bluestone, f.o.b. barge, 5x16-in., rough, 90c.
Birmingham: Granite, 5x16-in., 50c.; 6x20-in., 60c.; roundings, 5x16-in., 65c.; 6x20-in., 80c.
St. Louis: Class "B" straight, 5x16-in., 75c.; roundings, $1.05@$1.30.

ASPHALT—Paving asphalt, f.o.b., per ton. Packages are 350-lb. bbls. or 425-lb. drums, in carload lots:

	Packages	Tank-car or -boat
Atlanta	$18.40	$14.40
Baltimore (f.o.b. refinery)	16.00	12.00
Birmingham (f.o.b. refinery)	.....	**11.00**
Boston	22.00	17.50
Chicago	22.50	18.50
Cincinnati	.....	12.00
Cleveland	23.00	19.00
Dallas	20.00	.....
Denver	**35.00**	.....
Detroit	16.68	12.43
Kansas City (f.o.b. refinery)	16.00	11.00
Los Angeles (f.o.b. refinery)	*16.00*	*10.00*
Maurer, N. J. (Bermudez)	.....	*25.00*
Maurer, N. J. (Trinidad)	.....	*21.00*
Minneapolis (f.o.b. Twin Cities)	23.10	18.10
Montreal	28.00	21.50
New Orleans	24.00	21.00
New York (f.o.b. refinery)	16.00	12.00
Philadelphia	16.00	12.00
Pittsburgh	24@26	14@18
St. Louis	**20.50**	**16.50**
San Francisco (f.o.b. refinery)	18.00	12.00
Seattle	21.40	18.00

ROAD OILS—Prices, f.o.b., in tank cars, 8,000 gal. minimum, 45% asphalt, per gal.:

New York	$0.035
Birmingham	.06
St. Louis	.04
Dallas	.05

Iron and Steel

PIG IRON—Furnace, per gross ton:

Birmingham, No. 2 fdry., silicon, 1.75@2.25	$12.00
Pittsburgh, basic	*16.63*

STRUCTURAL STEEL—Prices per 100 lb., delivered from warehouse except in Birmingham and Pittsburgh, where prices are f.o.b. mill:

	Shapes, 3 to 15-In.	Plates ¼-in.
Birmingham	*$1.70*	*$1.70*
Chicago	*2.65*	*2.65*
Cleveland	2.95	2.90
Dallas	3.90	4.00
New York	2.35	2.35
Pittsburgh	1.65	1.65
St. Louis	3.25	3.25
San Francisco	*2.50*	*2.50*

BARS, CONCRETE REINFORCING—Prices per 100 lb., delivered from warehouse except in Birmingham and Pittsburgh, where prices are f.o.b. mill, on bars rolled from billets, size ½-in.:

Birmingham	$1.75	New York	$2.35
Chicago	*1.65@2.75*	Pittsburgh	1.60
Cleveland	*1.75*	St. Louis	2.50
Dallas	*2.33*	San Francisco	2.50

EXPANDED METAL LATH—Per 100 sq.yd., painted, delivered to job, in lots under 200 sq.yds:

Lb. per Sq.Yd.	New York	Bir-mingham	Chicago	St. Louis	Dallas	San-Francisco
2.2	*$13.00*	**$17.50**	$10.10*	$16.00	$18.00	$21.50
2.5	*14.00*	**18.50**	10.90*	17.00	19.50	22.50
3.0	*15.50*	**20.50**	12.25*	18.50	.....	25.00
3.4	*16.50*	**22.00**	13.10*	19.50	24.00	27.00

*More than 200 sq.yds.

WIRE REINFORCEMENT FOR CONCRETE—Plain, per 100 sq.ft., 4 in. x 4 in. triangle mesh; manufacturers' quotations are in carloads at mills; dealers' are delivered in lots of 10,000 sq.ft. or over:

Style Number	Weight in Pounds per 100 sq.ft.	Pitts-burgh Mill	Chicago District Mill	Del. From Warehouse: New York	St. Louis	Dallas	San Fran-cisco
032	22	$0.94	*$0.87*	$1.32	$1.30	$1.63	$1.22*
049	28	1.20	*1.11*	1.67	1.70	2.00	1.55*
068	30	1.47	*1.35*	2.07	2.10	2.25	1.91*
093	45	1.88	*1.74*	2.65	2.65	2.86	2.46*
126	57	2.33	*2.15*	3.28	3.30	3.52	3.03*
153	68	2.78	*2.56*	3.92	3.95	4.20	.....
180	78	3.19	*2.95*	4.49	4.35	4.80	.....

* F.o.b.

STEEL SHEETS—Prices per 100 lb. for base sizes, delivered from warehouse except in Pittsburgh, where prices are f.o.b. mill:

	Blue Annealed No. 10*	Black No. 24	Galvanized No. 24
Chicago	*$2.85*	*$3.00*	*$3.85*
Cleveland	3.00	3.60	4.00
New York	2.65	3.50	4.00
Pittsburgh	1.85	2.15@2.25	2.75@*2.80*
St. Louis	3.45	*3.80*	*4.35*
San Francisco	3.65	4.15	4.65

*Light plates.

WIRE ROPE—Discounts from manufacturers' list price on regular grades of bright and galvanized, Eastern Territory, New York, and East of Missouri River

	Base
Cast steel round strand rope	20%
Galvanized iron rigging and guy rope (add to list)	12½%
Galvanized steel rigging and guy rope	7½%
Plow steel round strand rope	35%
Round strand iron and iron tiller	5%
"Special Steel" and extra strong cast steel, round strand rope	27½%

Discount 5 points less than discount for Eastern territory: California, Oregon, Nevada, Washington, Wyoming, New Mexico, Colorado, North Dakota, Nebraska, Kansas, Oklahoma and Texas. Discount 10 points less than discount for Eastern territory: Arizona, Montana, Idaho and Utah.

RIVETS—Structural rivets, round head, ½-in., full kegs, per 100 lb., delivered from warehouse, except in Pittsburgh, where prices are f.o.b. mill:

Chicago	$4.00
Dallas	5.00
Denver	4.65
New York	4.00
Pittsburgh	2.75
St. Louis	4.15
San Francisco	5.00
Seattle	4.50

STEEL SHEETPILING—Base price, f.o.b., Pittsburgh, for large mill lots, per 100 lb. $1.90

TERNE PLATE—I C, 8-lb. coating, 20x28-in., f.o.b., Pittsburgh mill:
Per package $10.30

SHIP SPIKES—Per 100 lb., black, from dealers' warehouse stocks; galvanized are about $1.75 per 100 lb. higher:

	½-In.	⅝-In.	¾-In.
San Francisco	$5.50	$5.05	$4.90
Seattle	7.75	5.65	5.50

Pittsburgh mill base in lots of 200 kegs or more, *$2.90* per 100 lb.

WIRE NAILS—Per 100 lb. keg, base, delivered from warehouse stocks; also Pittsburgh mill base:

Pittsburgh Mill	Birming-ham	Chicago	St. Louis	Dallas	San Francisco	Montreal
$1.95@*2.00*	*$2.65*	$3.30	**$2.40**	$3.50	$3.00	$4.95

SCRAP—The prices following are, f.o.b., per ton, paid by dealers:

	New York Per Gross Ton	Chicago Per Gross Ton	Detroit Per Gross Ton
No. 1 railroad wrought	*$8.25*	$8.00@$8.50	.....
Stove plate	*3.75*@4.50	7.50@ 8.00	$5.25
No. 1 machinery cast	**7.75**	10.50@ 11.00	7.50*
Machine shop turnings	2.00	3.75@ 4.25	4.50
Cast borings	2.25	3.75@ 4.25	4.25
Railroad malleable	*7.50*	*9.50*@ *10.00*	9.50
Re-rolling rails	*5.00*	10.50@ 11.00	9.00
Misc. steel rails	.....	*8.50*@ *9.00*	*10.00*
Heavy melting steel, No. 1	*4.50*	8.50@ 9.00	*9.00*
Iron and steel pipe	*6.00*	*3.50*@ *4.00*	.....

*Net ton.

FREIGHT RATES—The following freight rates per 100 lb., effective May 20, 1930, apply on finished steel products in the Pittsburgh district, including plates, structural shapes, merchant-steel bars, pipe fittings, plain and galvanized wire nails, rivets, spikes, bolts, flat sheets (except planished), chains, etc.:

Atlanta	$0.58*	Detroit	$0.265†
Baltimore	.27†	Kansas City	.695†
Birmingham	.58*	New Orleans	.67*
Boston	.40†	New York	.33†
Buffalo	.235†	Pacific Coast (all rail)	1.15‡
Chicago	.34†	Philadelphia	.29†
Cincinnati	.265†	St. Louis	.39†
Cleveland	.185†	St. Paul	.60*
Denver	1.15‡		

*36,000 lb. †40,000 lb. ‡60,000 lb.

Railway Materials and Supplies

STEEL RAILS—Per gross ton, f.o.b.:

	Pitts-burgh	Birming-ham	Chicago
Standard openhearth rails	$43.00	$43.00	$43.00
Light rails, 25 to 45 lb.	34.00	33.00	34.00@36.00
Re-rolled rails	24.00@28.00	31.00	34.00@36.00

RAILWAY TIES—For fair-sized orders, f.o.b., the following prices per tie hold:

		6 In. x 8 In. by 8 Ft.	7 In. x 9 In. by 8½ Ft.
New York	Long-leaf sap pine, untreated	$1.00	$1.20
	Creosoted—prices on application.		
Birmingham	White oak, untreated	.75	1.25
	White oak, creosoted	1.50	1.80
	Southern pine, untreated	.50	1.00
	Southern pine, creosoted	1.10	1.20
Chicago	White oak, untreated	*1.21*	**1.75**
	Oak, empty cell, creosoted	*1.61*	**2.34**
	Oak, zinc treated	*1.49*	**2.19**
	Southern pine, creosoted	*1.38*	**1.94**
St. Louis	White oak, untreated	.95	**1.45**
	Red oak, creosoted	**1.25**	**1.80**
	Sap pine or cypress, untreated	.75	**1.20**
San Francisco	Douglas fir, green, untreated	.59	.73
	Douglas fir, empty cell, creosoted	1.41	1.90
Montreal	Birch or maple, untreated	.75@1.25	.75@1.25
	Birch or maple, creosoted	1.20@1.30	1.50@1.60

Current Prices of Construction Materials

Railway Supplies—Continued

TRACK SUPPLIES—Prices per 100 lb. f.o.b., for large mill lots, at Pittsburgh, Birmingham and Chicago, together with warehouse prices at other places named:

	Pittsburgh	Chicago	Birmingham	St. Louis	San Francisco
Standard spikes, ⅝-in. and larger	$2.70	$2.80	*$2.70*	$3.65@*$3.75*	$4.10
Track bolts	3.80	3.80	*3.70*	4.50@ *4.75*	5.10
Standard section angle bars, splice bars or fish plates	2.75	2.75	3.75*	.....	.....
Tie plates	1.95	1.95	*2.07½*	.....	.....

* At warehouse.

Pipe

WROUGHT STEEL PIPE—Discounts from standard lists for delivery from warehouse, except at Pittsburgh, where prices are f.o.b. mill:

	1 to 3-In. Butt Weld		3½ to 6-In. Lap Weld	
	Black	Galvanized	Black	Galvanized
Chicago	57.3%	44.8%	53.9%	41.4%
Cleveland	53.3%	42.3%	50.8%	37.8%
New York	56.14%	43.6%	52.72%	40.18%
Pittsburgh	64%	52.5%	61%	49.5%
St. Louis	51%	38%	48%	35%

CAST-IRON PIPE—Prices per net ton, for bell and spigot pipe, Class B and heavier, f.o.b., on regular lots of pipe:

	4-In.	6-In. and Over
Birmingham mill	$38.00@$39.00	$35.00@$36.00
Burlington (N. J.) mill	37.00@ 38.00	34.00@ 35.00
Chicago	46.00@ 47.00	43.00@ 44.00
New York	40.00	37.00
Pittsburgh	46.50@ 47.50	43.50@ 44.50
St. Louis	45.00@ 46.00	42.00@ 43.00
San Francisco	48.00@ 49.00	45.00@ 46.00

Gas pipe and Class A, $3.00 per ton extra.

SEWER PIPE—Prices delivered, per foot, for standard pipe; 6, 8 and 12-in. are single strength and 18, 24, 30 and 36-in. are double strength:

	6-In.	8-In.	12-In.	18-In.	24-In.	30-In.	36-In.
Atlanta	$0.105	$0.175	$0.315	.....	.....	.....	.....
Baltimore	.10	.30	.58	.....	$1.93	.....	$6.50
Birmingham	.135	.225	.405	**$0.85**	1.625	$3.18	4.38
Boston	.18	.28	.55	1.35	2.38	3.95	5.90
Chicago	.18	.28	.54	1.25	2.25	4.75	6.00
Cincinnati	.135	.21	.405	1.125	2.025	3.672	5.74
Cleveland	.189	.294	.567	1.35	2.43	4.824	7.38
Dallas	.23	.325	.586	1.106	1.95	3.68	5.00
Denver	.161	.23	.414	.816	1.44	.....	.....
Detroit	.18	.28	.6075	1.50	2.70	5.12	.....
Kansas City	.21	.33	.52	1.22	1.90	3.60	.....
Los Angeles	.21	.29	.52	1.186	2.03	3.39	5.09
Minneapolis	.155	.24	.50	1.15	1.85	3.45	4.60
Montreal	.30	*.40*	.75	**1.95**	2.60	.....	7.20
New Orleans	*.17*	*.28*	*.50*	*.98*	*1.90*	.....	.....
New York	.17	.265	.52	1.30	2.34	4.47	6.86
Philadelphia	.0945	.147	.297	.80	1.44	2.304	3.28
Pittsburgh	.1575	.245	.54	1.25	2.25	4.68	7.17
St. Louis	.1295	**.235**	.423	1.05	1.80	3.20	4.40
San Francisco	.21	.30	.54	1.26	2.16	3.60	5.40
Seattle	.22	.30	.54	1.26	2.16	3.50	5.50

CLAY DRAIN TILE—Prices delivered by dealers, per 1,000 lin.-ft.:

Size, In.	New York	Birm'ham	Pittsburgh	St. Louis	Dallas	San Fran.	Seattle
4	*$43.00**	*$50.00*	$80.00	$50.00	$80.00	$67.50	$60.00
6	*78.00**	*85.00*	110.00	85.00	110.00	112.50	112.00

*F.o.b.

Miscellaneous

LINSEED OIL—Raw oil, f.o.b., in 1- to 4-bbl. lots, per lb.:
New York.... **$0.096** Chicago.... *$0.098* Minneapolis... *$0.101*

WHITE AND RED LEAD—Base price per 100-lb. keg, f.o.b., New York: White, dry, $13.25; White, in oil, $13.25; Red, dry, $13.25; Red, in oil, $14.75.

CHEMICALS—Water, sewage treatment, road work, round lots in the New York market:

Sulphate of aluminum, in bags, per 100 lb	$1.25@$1.40
Sulphate of copper, in bbl., per 100 lb	*3.70@ 4.00*
Soda ash, 58%, in bags, per 100 lb	1.15@1.17½
Chlorine, cylinders, per lb	.04@ .06
Bleaching powder, in drums, f.o.b. works, per 100 lb	2.00@ 2.10
Calcium chloride, flaked, in drums, f.o.b. works, per ton	22.75

MANILA ROPE—The number of feet per pound for the various sizes is as follows: ⅝-in., 7-ft.; ¾-in., 6-ft.; 1-in.; ¼-in., 4-ft., 5-in.; 1-in., 3-ft., 8-in.; 1¼-in., 2-ft., 5-in.; 1½-in., 1-ft., 8-in. Following prices are quoted by dealers per pound or ¾-in. and larger:

Atlanta	$0.20	Kansas City	$0.25
Baltimore	.225	Los Angeles	*.175*
Birmingham	.25	Minneapolis	.19
Boston	.20	Montreal	.185
Chicago	.17	New Orleans	*.20*
Cincinnati	.21	New York	*.17*
Cleveland	.21	Philadelphia	.21
Dallas	.26	St. Louis	*.165@.17*
Denver	.20	San Francisco	.175
Detroit	*.185*	Seattle	.175

BUILDING PAPER—Black, 50-lb. per roll of 500 sq.ft., in carloads, f.o.b., producing point $2.16

SLATERS FELT—In carloads, per roll, f.o.b., producing point $0.79

ROOFING MATERIALS—Prices, f.o.b. New York, delivered by dealers to contractors, in carloads:

Asphalt felt, per 100 lb	$3.00
Tar felt, per 100 lb	3.00
Asphalt coating, per gal	.34½
Tar pitch, in 350 lb. barrels, per ton	28.00

PREPARED ROOFINGS—Prices, delivered by dealers to contractors, in carloads, f.o.b. New York, per square:

Single shingles, slate finish, sufficient to cover 100 sq.ft.	**$6.50**
Strip shingles, 4 in 1, hexagonal shape, with Underwriters' label	**6.25**
Slate surfaced roofing in rolls weighing 85 to 90 lbs	2.50

WINDOW GLASS—Discounts from latest jobbers' window-glass list, dated Sept. 15, 1928, at New York warehouse:

	Single Thickness		Double Thickness	
	A Quality	B Quality	A Quality	B Quality
First 3 brackets	89%	91%	88%	90%
Larger sizes	88%	90%	88%	90%

EXPLOSIVES—Price per pound for dynamite delivered in small lots—under 200 lb.:

	Gelatin 40%	Gelatin 60%		Gelatin 40%	Gelatin 60%
Atlanta	$0.22	$0.245	Los Angeles†	*$0.1725*	*$0.1925*
Baltimore	.215	.2375	Minneapolis	.20	.225
Birmingham	.1325	.1575	Montreal	.20	.24
Boston	.225	.25	New Orleans	.195	.22
Chicago	.195*	.22*	New York	*.245‡*	*.2675‡*
Cincinnati	.22	.245	Philadelphia	.215	.24
Dallas	.2125	.2475	St. Louis	.215	.235
Denver, f.o.b.	.19	.2125	San Francisco	.155	.18
Kansas City, Mo.	.2025	.2225	Seattle	.1525	.175

*Quantities above 500 lb. but less than a ton. †San Fernando Arsenal. ‡Special gelatin in case lots.

Lumber

Prices Are Per Thousand Feet, Board Measure

New York—Timbers, No. 1 Common, rough, delivered to contractor at site of job, in Manhattan, in 20 ft. lengths and under, per M. ft., b.m.:

	Long-leaf Yellow Pine	Douglas Fir
3x4 to 8x8	*$47.50*	$30.00
3x10 to 10x10	55.00	31.50
3x12 to 12x12	65.00	32.50
3x14 to 14x14	72.50	35.50

Chicago—Timbers, No. 1 Common, rough, per M. ft. b.m., f.o.b., in carloads For delivery to job from stock, in truckloads, add $10 per M. ft., b.m.:

	20 Ft. and Under Long-Leaf Yellow Pine	Up to 32 Ft. Douglas Fir
3x4 to 8x8	$39.50	$37.50
3x10 to 10x10	47.00	37.50
3x12 to 12x12	58.00	37.50
3x14 to 14x14	71.00	38.50

San Francisco—Douglas fir, No. 1 Common, rough, at yards. For delivery to contractor at site of job, add $5 per M. ft., b.m.:

	10-16-18 and 20 Ft.	22 and 24 Ft.
3x3 and 4	$30.00	$32.00
3x6 and 8	30.00	32.00
3x10 and 12	30.00	32.00
3x14	33.00	34.00

Other Cities—Delivered by dealers, No. 1 Common, rough, per M. ft., b.m.:

	8x8-In. x 20 Ft. and Under				3x12 to 12x12-In. 20 Ft. and Under	
	Pine	Fir	Hemlock	Spruce	Pine	Fir
Atlanta	$50.00	.....	.....	.....	**$65.00**	.....
Baltimore	36.00	$50.00	$53.50	**$61.75**	75.00	$50.25
Birmingham	*46.00*	.....	.....	.....	**76.00**	.....
Boston	51.00	45.00	47.00	48.50	57.00	42.00
Cincinnati	42.50	55.00	.....	.....	52.50	52.50
Cleveland	54.00	54.00	.....	.....	45.00	49.00
Dallas	55.00	57.50	55.00	55.00	55.00	50.00
Denver	.....	**50.00**	**50.00**	.....	.....	*44.50*
Detroit	53.00	51.00	.....	.....	65.00	51.00
Kansas City	36.00	36.50	36.50	.....	55.00	42.00
Los Angeles	.....	43.50	.....	.....	.....	45.50
Minneapolis	.....	46.25	.....	.....	.....	46.25@47.75
Montreal	.....	.....	.....	40.00	40.00	.....
New Orleans	*38.00*	*38.00*	.....	*43.00*	*63.00*	*58.00*
Philadelphia	48.00	42.00	41.00	46.00	58.00	42.00
Pittsburgh	53.00	57.00	65.00	66.00	43@57	57@60
St. Louis	*47.00*	39.00	39.00	.....	*56.00*	40.00
Seattle	.....	18.00	.....	.....	.....	17.00

	1x10 In. x 16 Ft. and Under			2x10 In. x 16 Ft. T. & Gr.	
	Pine	Fir	Hemlock	Pine	Fir
Atlanta	$55.00	.....	.....	**$40.00**	.....
Baltimore	54.00	$44.00	$43.75	.....	.....
Birmingham	40.00	.....	.....	**55.00**	.....
Boston	46.00	40.00	42.00	48.00	$44.00
Cincinnati	45.00	47.50	.....	35.00	45.00
Cleveland	65.00	54.00	.....	42.00	54.00
Dallas	60.00	.....	.....	55.00	.....
Denver	.....	36.00	36.00	.....	**48.00**
Detroit	**49.00**	**45.00**	.....	**46.00**	**45.00**
Kansas City	45.00	35.00	35.00	35.00	33.00
Los Angeles	40.50	40.50	.....	.....	48.50
Minneapolis	65.00*	40.00	.....	45.00*	39.00
Montreal	45.00	50.00	40.00	.....	55.00
New Orleans	*39.00*	*39.00*	.....	54.00	48.00
Philadelphia	50.00	42.00	40.00	53.00	42.00
Pittsburgh	40.00	47.00	55.00	40.00	50.00
St. Louis	39.00	39.00	39.00	*42.00*	40.00
Seattle	.....	17.50	.....	.....	16.00

*Northern Pine, No. 2 Com.

PILES—Prices of Nichols Bros., 90 West St., N.Y.C., per lineal foot, pine, with bark on, f.o.b., New York; delivered from barge, 1½ to 2c. per ft. additional:

Dimensions	Points	Length	Barge	Rail
12 in. at butt	6 in.	30 to 50 ft.	$0.12	$0.165
12 in.—2 ft. from butt	6 in.	50 to 59 ft.	.165	.215
12 in.—2 ft. from butt	6 in.	60 to 69 ft.	.19	.235
14 in.—2 ft. from butt	6 in.	50 to 69 ft.	.225	.345
14 in.—2 ft. from butt	6 in.	70 to 79 ft.	.2425	.295
14 in.—2 ft. from butt	5 in.	80 to 85 ft.	.305	.395
14 in.—2 ft. from butt	5 in.	85 to 89 ft.	.345	.435

CONSTRUCTION NEWS

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Some of the Week's Large Projects

For further details turn to the appropriate sections in this issue.

Location	Project	Cost	Status
Waterworks			
Pasadena (Calif.)	Waterworks dam	$5,000,000	Proposed
Memphis	Pumping Station, etc.	2,000,000	Proposed
Sewers			
Cleveland	Sewage disposal plant	14,000,000	Proposed
Bridges			
Kansas City (Kan.)	Bridge	1,400,000	Proposed
Omaha	Bridge	2,000,000	Bonds voted
Streets and Roads			
Georgia	Roads	1,750,000	Bids asked
Federal Government			
Little Rock (Ark.)	Post office	1,435,000	Bids asked
Newark (N. J.)	Post office and Courthouse	6,150,000	Proposed
Albany (N. Y.)	Post office, Custom and Courthouse	2,000,000	Proposed
San Antonio	Post office	1,600,000	Proposed
Paris (France)	Embassy	1,297,000	Contracts
Unclassified			
Oklahoma and Missouri	Gas pipe line	1,400,000	Proposed
Power Plants			
Ottawa (Ont.)	Power development	1,000,000	Proposed
Buildings			
New York	Bank and office	10,000,000	Contracts
Los Angeles	Office and store	2,000,000	Proposed
Newton (Mass.)	City hall	1,000,000	Bids asked
Des Moines (Iowa)	Telephone exchange	1,125,000	Proposed
Austin (Tex.)	University	3,050,000	Proposed

WATERWORKS

PROPOSED WORK

Calif., Pasadena — Bids within next two months Pine Canyon Dam, concrete gravity type, 300 ft. high above found., incl. 450,000 cu.yd. mass concrete, reservoir to impound 40,000 acre ft. water, in San Gabriel Canyon, 4 mi. above Azusa. $5,000,000. S. B. Morris, City Hall, engr. Noted Sept. 25.

Mass., Attleboro—Preliminary plans waterworks extensions, incl. rebuilding dam, clearing site. $50,000. J. J. Van Valkenburg, Irving Sq., Framingham, engr.

Tenn., Memphis—Bd. Water Comrs. bids after July 15, James Sheahan Water Pumping Station incl. 2 gravel-wall wells, Layne & Bowlers electric pump, 12 test wells, at Normal State Teachers College, Normal. $2,000,000. Fuller & McClintock, McCall St. and South Front St., Memphis, and 170 Bway., New York, engrs. T. H. Allen, McCall St., assoc. engr. Noted Mar. 12.

BIDS ASKED

N. Y., Brooklyn—July 7, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in Avenue X, Boynton and South Elliott Pls., Bay Ridge, Flatlands and 10th Aves., Prospect, 12th, 52nd, 54th, 57th, 67th and 68th Sts.

N. Y., Long Island City—July 7, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in 46th Rd., 28th, 158th, 161st, 189th, 201st and 213th Sts., 48th, 62nd, 28th, 35th, 37th and 46th Aves., Queens Boro.

N. Y., Rockaway Point (sta. Brooklyn) — See "Contracts Awarded."

R. I., Providence—July 6, by City Clerk, City Hall, booster pump house. S. F. Nolan, City Hall, engr.

CONTRACTS AWARDED

Ky., Paris—City Council, large concrete dam over Stoner Creek, near site former Spears Mill Dam, also changes, additions to filtration and pumping plant buildings, to Clark, Stewart & Wood, Lexington; changes and additions to pumping plant, filtration and settling basins, to Higgins Constr. Co., Charlotte, N. C. Noted Apr. 23.

N. J., Passaic—Passaic Valley Water Comn., 156 Ellison St., Paterson, 12,500 lin.ft. 36 in. plate, etc., to Lock Joint Pipe Co., Ampere; 6,400 lin.ft. c.i. pipe, etc., to Sanitary Eng. & Constr. Co., Paterson. Noted June 11.

N. J., Spring Lake—Bd. Boro Council, 32,000 lin.ft. 6- to 10-in. mains, tanks, equipment, to A. S. Mundy & Co., Main St., Woodbridge, $78,581. Noted Apr. 2.

N. Y., Brooklyn—Dpt. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in Avenue P and Albany Ave., et al., to Empire Contg. Co., Inc., 209 Bway., West New Brighton, $6,840. Noted June 11.

N. Y., Kenmore — Village Bd., Town Hall, 12 in. water line in Hamilton Blvd., to W. W. Kimmins & Son, 243 Tremont Ave., $30,780. Est. $55,000. Noted June 11.

N. Y., Rockaway Point (sta. Brooklyn) — Rockaway Operating Co., 421 7th Ave., New York, 1 story, 48 x 48 ft. pumping station, at Roxbury, day labor, $15,000 or more. Noted June 18.

SEWERS

PROPOSED WORK

Md., Baltimore—Bd. Awards soon takes new bids sanitary sewers, storm drains listed in Storm Water Contr. 165. Former bids rejected. M. J. Ruark, Municipal Bldg., sewerage engr.

Mo., Ferguson — St. Ferdinand Sewer Impvt. Dist. postponed indefinitely construction combination storm and sanitary sewers in St. Louis Co. $2,500,000. E. H. Hancock Eng. Co., 6228 Easton Ave., St. Louis, engrs. Noted Dec. 26, 1929.

O., Cleveland—City, grading of site and pier, bulkhead and cofferdam work for proposed sewage disposal plant, East 140th St. and Lake Erie. Total est. $14,000,000. G. B. Gascoigne, Leader Bldg., engr. Noted Feb. 19.

Okla., Boise City—City Council soon takes bids complete sewage disposal plant, auxiliary piping. C. A. Haskins, 822 Finance Bldg., Kansas City, Mo., engrs.

Wis., Racine—Sewage disposal plant, 1 mi. intercepting sewers, $700,000. Alvord, Burdick & Howson, 20 North Wacker Dr., Chicago, Ill., engrs.

BIDS ASKED

Ark., Forrest City—July 8, by Commissioners District, 20,000 ft. 6- to 10-in. vitr. clay sewrs, 6 to 18 ft. deep, manholes, appurtenances. Ford & MacCrea, Gazette Bldg., Little Rock, engrs.

Ia., Creston—July 9, by City Council, complete sewage plant, incl. 1 mi. 30 in. outfall sewer, intercepting sewer, pumping station. P. K. DeVoe, city engr.

Kan., McPherson—July 7, by City, c/o D. R. Malty, mayor, main sewers, sewage treatment plant, incl. outfall lines from 2 plants, control building with equipment, machinery, settling tank, installing machinery now purchased, round or square rock filter beds, resettling tank, digester, installing equipment now purchased, sludge drying beds, by-passes, piping, valves, concrete work, sidewalks, driveways, fencing excavation, grading. $80,000. E. T. Archer & Co., New England Bldg., Kansas City, Mo., engrs.

N. J., Newark—July 7, by Bd. Freeholders Essex Co., Hall of Records Bldg., storm water drainage system in Grove St. and Watchung Ave. between 3rd River and Grove St. in parts Glen Ridge, Montclair and Bloomfield. $25,000 or more. W. Stickles, Hall of Records Bldg., co. engr.

N. Y., Long Island City—July 7, by G. U. Harvey, pres. Queens Subway Bldg., sewers in Horace Harding Blvd., Jupiter Valley and 75th Rds., Polhemus Ave., 21st, 74th, 164th and Lawrence Sts.

N. Y., New York—July 8, by S. Levy, pres. Manhattan Boro, Municipal Bldg., sewers in West 58th St., east side Bway. between East 23rd and East 24th Sts.

N. Y., Rome — July 22, by Dpt. Mental Hygiene, State Office Bldg., Albany, completing Contr. 499, sewage disposal plant at Rome State School. F. W. Parsons, comr.; adv. E. N.-R. July 2.

S. D., Aberdeen—July 8, by Bd. Comrs. Brown Co., at office O. E. Hundstad, aud., bridge on Sect. 2, and 11-124-63—6 x 4 ft. twin box culvert between Sect. 35-126-63 and Sect. 2-125-63—one 8 x 3 ft. C.B.C. between 8 and 17-122-64.

CONTRACTS AWARDED

Calif., Los Angeles—Bd. P. Wks., City Hall, sanitary sewers, house connections, resurfacing 112th St. and Willowbrook Ave., to J. Kapetanich, 755 South Boyle Ave., $188,303. Est. $161,103.

Mass., Boston—Dpt. P. Wks., J. A. Rourke, comr., sewerage works in Maywoods Brook, Dale St., etc., Roxbury, to A. Piatelli & Co., 56 Rockdale St., Dorchester, $44,569.

Mass., Brookline—Town, surface drain from Village Brook to Washington St., to T. J. McCue, 264 North Beacon St., Watertown, $40,000.

N. Y., New York—H. Bruckner, pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., sewers in Barker Ave., to F. Nordone, 2134 Bisel Ave., $67,421; in 241st St. and Fish Ave., to N. Gabrielle, 1382 Plimpton Ave., $3,810 and $517 respectively. Grand total $71,748? Noted June 11.

N. Y., New York—S. Levy, pres. Manhattan Boro, Municipal Bldg., sewers in 10th Ave., 49th Sts., to Reno Eng. Co., 645 Tremont Ave., $415,386. Noted May 28.

N. Y., Saranac Lake—Sewage disposal plant, to W. F. Lose, Tonawanda, $97,900.

WASTE DISPOSAL

BIDS ASKED

N. Y., Castleton Corners—July 8, by J. G. W. Greeff, comr. Dpt. Hospitals, Municipal Bldg., New York, garbage and refuse incinerator plant, incl. chimney, plumbing, at Sea View Hospital.

Pa., Erie—July 7, by City, M. J. Henry, clk., garbage and refuse incinerator building complete, brick chimney 125 ft. high, incl. mechanical trades, N. S. West, 16th St. F. A. Fuller, 721 Commerce Bldg., engr. Noted Mar. 26.

CONTRACTS AWARDED

Pa., Altoona — General contract refuse incinerator, water jacketed type, brick, concrete, furnaces, preheater, chimney, to Shaughnessy Tool & Incinerator Co., 434 10th St., Oakmont, and Columbia Constr. Co., Inc., Altoona, $49,500. Est. $50,000. Noted June 4.

BRIDGES

PROPOSED WORK

Kan., Kansas City—Regional Bridge Co., c/o F. A. Davis, secy., 707 Commerce Bldg., soon takes bids, 1,555 ft. concrete, steel bridge with 55 ft. ship clearance and 450 ft. southern approach over Missouri River between Platte and Wyandotte Counties. $1,400,000. Strauss

See proposal advertising on page 95

Constr. News page 1

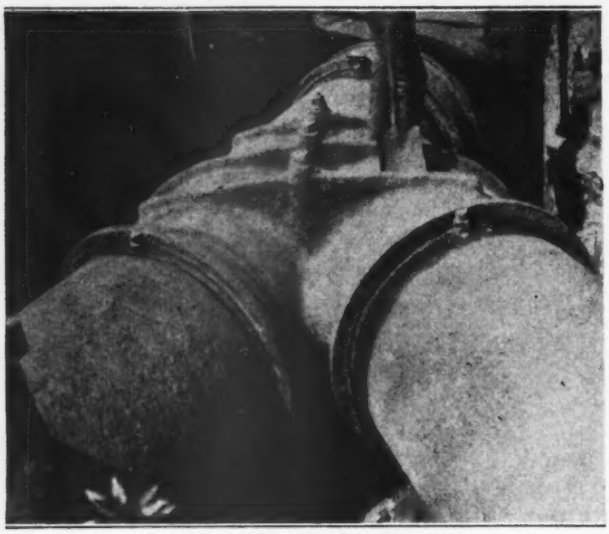
LEADITE

Trade Mark Registered U.S. Pat. Office

20 in. Water Main—LEADITE Joints

60 in. Water Line—LEADITE Joints

48 in. Water Line—LEADITE Joints

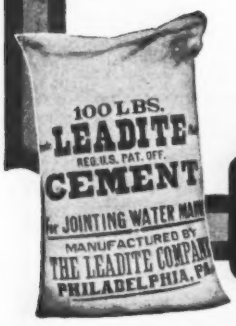


48 in. Water Line—with LEADITE Joints

Many miles of bell and spigot pipe beneath the surfaces of paved streets,— *are jointed with* LEADITE, with excellent results

Thousands of miles of bell and spigot pipe throughout the world, are jointed with LEADITE.

The pioneer self-caulking material for c. i. pipe
Tested and used for over 30 years.
Saves at least 75%.



THE LEADITE COMPANY
Land Title Building - Philadelphia, Pa.

No Caulking

Bridges (Continued)

Eng. Corp., J. B. Strauss, pres., 307 North Michigan Ave., Chicago, Ill., engrs. Contract for forty-five 35 ft. cypress pilings to be placed under each of 11 piers on Kansas side of bridge, awarded to A. L. McCallum, 227 North 15th St. Noted Jan. 23.

N. J., Mount Holly—Bd. Freeholders Burlington Co., repairing bridge over Rancocas Creek between Riverside and Delanco, $65,000. H. B. Smith, Mount Holly, co. engr.

N. J., Paterson—Bd. Freeholders Passaic Co., Court House, steel, rein.-con. span bridge over Passaic River at Wayne and McBride Aves. $300,000. G. Ferguson, Court House, co. engr.

BIDS ASKED

Indiana—July 15, by State Hy. Comn., Indianapolis, 112 ft. bridge Rd. 22 west of Greentown, Howard Co.—two 40 ft. span bridge Rd. 56, west of Hanover, Jefferson Co.—one 72 ft. bridge north of Howe and one 96 ft. bridge south of Howe, Rd. 9, LaGrange Co.—five 40 ft. span bridge, also grading 22,000 cu.yd. approaches, Rd. 150 south of Shoals, Martin Co.—25 ft. bridge south of Valparaiso, 24 ft. bridge west of Valparaiso, 25 ft. bridge southwest of Valparaiso, Rd. 2, Porter Co.—18 ft. bridge, Rd. 68, east of Poseyville, and 60 ft. bridge, Rd. 69, south of New Harmony, Posey Co.—32 ft. bridge, Rd. 43, north of Medaryville, Pulaski Co. — three 65 ft. span bridge, north of Greencastle and 96 ft. bridge south of Fincastle, Rd. 43, Putnam Co.—24 ft. bridge and 30 ft. bridge, both Rd. 29, south of Versailles, Ripley Co.—32 ft. bridge, Rd. 43, north of San Pierre, Stark Co. J. J. Brown, dir.

Me., Bucksport—July 15, by Directors Waldo-Hancock Bridge, c/o Chief Engineer State Hy. Comn., Augusta, reconstructing Verona Island Bridge over east channel Penobscot River. Robinson & Steinman, 117 Liberty St., New York, consult. engrs.; E. N.-R. July 2.

Burlington Co. A. L. Grover, ch. clk.; adv. E. N.-R. July 2.

Massachusetts—See "Streets and Roads."

N. J., Atlantic City—July 8, by Bd. Freeholders Atlantic City, reconstructing bridge over Hammontown Creek, on Columbia Rd., in Mullica Twp. $25,000. A. H. Nelson, 741 Guarantee Trust Bldg., co. engr.

Pennsylvania—See "Streets and Roads."

CONTRACTS AWARDED

N. J., Englewood—State Hy. Comn., Trenton, bridge to carry Jones Rd. across Route 4, Sect. 3, Bergen Co., to Winfield-Stader & Co., 1431 Bway., New York, $53,567. Noted June 11.

Ohio—O. W. Merrell, dir. hys., Columbus, 50 ft. span concrete beam bridge, 24 ft. roadway, approaches, Sect. "P" Archbold-Defiance Rd., Fulton Co., to C. Ratzloff, 411 West Clinton St., Napoleon, $6,141; reconstructing existing overhead railroad crossing over Baltimore & Ohio R.R., and bituminous macadam paving Sect. "U" Cleveland-East Liverpool Rd., Portage Co., to Ferwerda Bros. Constr. Co., 5700 Dunham Rd., Bedford, $56,929. Noted June 4.

South Carolina—State Hy. Dpt., Columbia, concrete substructure bridge Cherokee Co., to R. H. H. Blackwell, Kingsport, Tenn., $59,744—steel superstructure for same bridge, to Dewey Bros., Goldsboro, N. C., $47,984 — concrete bridge, Chesterfield Co., to F. A. Triplett, Bethune, $15,897—steel bridge, Colleton Co., to Florida Bridge & Constr. Co., Orlando, Fla., $10,800—timber bridge, Dillon Co., to Kershaw County Bridge Dpt., Camden, $1,364—3 concrete bridges Spartanburg Co., to D. M. Rickenbacker, Union, $37,048. Grand total $172,837. Noted June 4.

STREETS AND ROADS

BIDS ASKED

Georgia—July 15, by State Hy. Dpt., East Point, J. W. Barnett, engr., concrete paving 6 mi. hy. Stephens Co.—6 mi. Franklin Co.—6 mi. Chattahoochee Co.—5 mi. Wilkes Co.—5 mi. De Kalb Co.—5 mi. Upson Co.—6 mi. Bryan Co.—12 mi. Henry Co.—7 mi. Lee Co.—limerock paving 9 mi. Baldwin Co.—8 mi. Early Co. —grading 4 mi. Cherokee Co.—14 mi. Carroll Co.—12 mi. Webster Co.—bridges on hys. in Morgan, Schley, Richmond, Grady and Seminole Counties. $1,750,000.

Kansas—July 10, by State Hy. Comn., Court House, Olathe, grading, culverts 6.467 mi. Kansas Project 9, Federal Aid Project 350-A, 30 ft. Nemaha Co. W. V. Buck, Topeka, hy. engr.

Maryland — July 7, by State Roads Comn., G. C. Uhl, chn., Baltimore, gravel surfacing 2.34 mi. Contr. C-49-82, Calvert Co.—1.40 mi. Contr. C-50-84 both Calvert Co. — 2.07 mi. Contr. Ce-102-22, Cecil Co.—1.46 mi. Contr. Ch-106-82, Charles Co.—concrete paving 1.42 mi. Contr. Wi-77-12, Wicomico Co.; adv. E. N.-R. July 2.

Massachusetts—July 7, by Dpt. P. Wks., bituminous macadam paving 20,854 ft. hy. Canton, Westwood and Dedham; steel stringer bridge over New York, New Haven & Hartford R.R., and rein.-con. slab bridge over Neponset River, and rein.-con. and bituminous macadam paving 27,748 ft. hy. Foxboro, Sharon, Walpole and Wrentham. A. W. Dean, Dpt. P. Wks., State House, Boston, engr.

Mass., Malden (br. Boston)—Sheet asphalt repaving Lebanon St., separate contracts. $25,000.

Minn., Duluth—July 7, by S. Shepard, clk. St. Louis Co., widening 1.25 mi. County Rd. 266—3 mi. Co. Rd. 269—0.75 mi. Co. Rd. 269 Project 2—2 mi. Co. Rd. 285, Project 1—grading, graveling Co. Rd. 954—2¼ mi. Co. Rd. 6 — 2¼ mi. Co. Rd. 6 Project 3 — 8,284 ft. State Aid Rd. 12 — 1,400 ft. Co. Rd. 3½ — 0.25 mi. Co. Rd. 31 — 1 mi. Co. Rd. 47—5,475 ft. Co. Rd. 58—5,400 ft. Co. Rd. 86—7,000 ft. Co. Rd. 86—2,000 ft. Co. Rd. 143—2 mi. Co. Rd. 152—500 ft. at Great Northern R.R. crossing—1.25 mi. Co. Rd. 223—4,200 ft. Co. Rd. 595—2,640 ft. Co. Rd. 107—2,000 ft. Co. Rd. 313—2,000 ft. Co. Rd. 371—3,000 ft. Co. Rd. 551—1,395 ft. Co. Rd. 613—1,500 ft. Co. Rd. 62—2.75 mi. Co. Rd. 73—2,000 ft. Co. Rd. 317—0.15 mi. Co. Rd. 717—1.25 mi. Co. Rd. 726—0.75 mi. Co. Rd. 4—2 mi. Co. Rd. 290—0.25 mi. Co. Rd. 297—1.25 mi. Co. Rd. 54—8,284 ft. State Aid Project 12—19,500 ft. Co. Rd. 48—2 mi. Co. Rd. 23—9.5 mi. State Aid Rd. 24—9.5 mi. State Aid Rd. 24—Oiling Co. Rd. 88—ditching 3,000 ft. Co. Rd. 22—1,000 ft. Co. Rd. 74—600 ft. Co. Rd. 101—3 mi. Co. Rd. 434—0.25 mi. Co. Rd. 471 —clearing and removing boulders on 3.5 mi. Co. Rd. 677—shoulders on 1.75 mi. Co. Rd. 291—6 mi. Co. Rd. 450—constructing Bridge L-4-24-1, on Co. Rd. 104—culverts on Co. Rds. 26, 71, 72, 78, 82, 89, 101, 111, 113, 114, 398, 408, 418, 421, 427, 430, 597, 651, 61, 450, and on State Aid Project 3. $245,448.

Mo., St. Louis—Bd. P. Serv., City Hall, soon takes bids 2 in. cold mix bituminous paving with traprock and emulsified aggregate 700 sq.yd. Watson Rd. from Pernod to Marquette Sts.—540 sq.yd. same street from Marquette to Maurice Sts. and 378 sq.yd. Watson Rd. from Maurice to Flyer Aves.—asphalt and asphaltic concrete paving 1,900 sq.yd. Watson Rd. from Pernod to Maurice Aves.—hot mix stone filled bituminous paving 500 sq.yd. same road from Maurice to Fyler Aves. W. W. Horner, city engr.

Nebraska — July 9, by State Bd. P. Wks., State House, Lincoln, grading, graveling, oil sand surfacing, 14 bridges, culverts and paving 8 mi. roads. R. L. Cochran, state engr.

New Jersey—July 13, by State Hy. Comn., Trenton, grading, 8 in. rein.-con. paving 41,708 sq.yd. Route 40, Sect. 4, Medford to Red Lion, Burlington Co. A. L. Grover, ch. clk.; ad. E. N.-R., July 2.

N. J., Bayonne—July 7, by Bd. City Comrs., City Hall, sheet asphalt paving Lincoln Parkway. $25,000. W. Clarkson, city engr.

N. J., Bayonne—July 7, by Bd. City Comrs., City Hall, grading, curbing, sidewalks, sewers, sheet asphalt on old concrete paving 8,000 cu.yd. 44th St. from Avenue B to Avenue C. $25,000 or more. W. Clarkson, city engr.

N. J., Hackensack — July 6, by Hackensack Impvt. Comn., Municipal Bldg., widening, granite block on concrete paving, fire and police alarm systems on Main St. from Salem to Passaic Sts. $50,000. F. Campbell, 167 Main St., engr.

N. J., Hackensack—July 7, by Bd. Freeholders Bergen Co., Court House, sheet asphalt on concrete or compressed base paving Passaic St. $25,000. R. McClave, Court House, co. engr.

N. J., Jersey City—July 7, by Bd. City Comrs., City Hall, sheet asphalt on concrete paving Newkirk St. from Baldwin to Sip Aves. $35,000. J. Henderson, city engr.

N. J., Jersey City—July 7, by Bd. City Comrs., City Hall, grading, sheet asphalt on concrete paving Steuben and Morgan Sts. $45,000 appropriated. J. Henderson, city engr.

N. J., Mountain Lakes — July 7, by Mayor and Boro Council, Boro Hall, 2 Boulevard W., curbing, culverts, bituminous penetration paving 17,200 sq.yd. Tower Hill-Lookout Impvt. F. T. Rubidge, boro engr.

N. J., New Brunswick—July 7, by Bd. City Comrs., City Hall, curbing, sheet asphalt on concrete paving Buccleach Pl. $25,000. A. Atkinson, city engr.

N. J., Roseland—July 3, by Boro Council, Boro Hall, curbing, 8 in. macadam paving Lincoln, Park and Freeman Sts. $25,000. P. K. Miller, 484 Bloomfield Ave., Montclair, boro engr.

N. Y., St. George—July 8, by J. A. Lynch, pres. Richmond Boro, Boro Hall, resurfacing, placing cinders on Keegan's Lane; reconstructing culvert on Maguire Ave.

O., Cincinnati—July 3, by Comrs. Hamilton Co., concrete curbing, concrete guttering, cement sidewalks, grading, concrete repaving 40,500 sq.yd. Euclid Rd. from Camargo to Cincinnati-Zanesville Rds. $127,631. E. A. Gast, Court House, engr.

O., Youngstown—July 7, by Dpt. P. Wks., stone curbing, grading, concrete paving 3,570 sq.yd. South Bellevista Ave. from Mahoning to Wehr Aves. $12,000—stone curbing, 3 in. vitr. brick on 7 in. concrete paving 1,000 sq.yd. Raymond Ave. from Norwood to Crandall Sts. $5,000—stone curbing, grading, concrete paving $5,000 sq.yd. Winchester Ave. No. 2 from Mahoning to Connecticut Aves. $10,000. G. F. Turner, City Hall, engr.

Pennsylvania—July 10, by State Hy. Dpt., Harrisburg, grading, drainage structures, bridges, shoulders, vitr. brick on one course concrete, vitr. brick on one course relaid brick or plain concrete surfacing incl. trolley section, 25,839 sq.yd. Route 243, Sects. 4 and S, Midland Borough, Beaver Co.—grading, drainage structures, bituminous surface treated macadam surface course or bituminous surface treated macadam on native or modified broken stone surfacing 6,825 sq.yd. Route 521, Sect. 1, Young Twp., Jefferson Co.—grading, drainage structures, one course rein.-con. surfacing 16,444 sq. yd. Route 18, Loyalsock Twp., Montoursville Borough, Lycoming Co. — 5,729 sq.yd. Route 140, North Manheim Twp., Schuylkill Haven Borough, Schuylkill Co. — grading, drainage structures, also two 40 ft. span rein.-con. beam bridge, 30 ft. roadway, over Raystown Branch of Juniata River, and two 45 ft. span rein.-con. beam bridge, 14 ft. roadway over same river, Station 831, Route 49, Sects. 1-A and B, Juniata Twp., Bedford Co.—grading, drainage structures, 77 ft. 6 in. span through plate girder bridge, 30 ft. roadway, also one course bituminous surface treated macadam surfacing 143 ft. approaches, 18 ft. wide over Green Creek, Route 249, Sect. 1, Greenwood Twp., Columbia Co.—fabricating, erecting 113 ft. 6 in. through plate girder span bridge, 32 ft. roadway over Lehigh Valley R.R., also one course rein.-con. surfacing 297 ft. approaches, 20 ft. wide, grading, foreign borrow surfacing 1,729 ft. roadway, 28 ft. wide, Route 515, Jenkins Twp., Laflin and Yatesville Boroughs, Luzerne Co.—one 45 ft. span rein.-con. beam bridge, 30 ft. roadway over Second Fork Creek, also grading, bituminous surface treated macadam on native stone surfacing 251 lin.ft. approaches, 18 ft. wide, Route 353, Sect. 1, Cummings Twp., Lycoming Co. S. S. Lewis, secy.; adv. E. N.-R. July 2.

Tex., Freeport—City Comrs. taking bids 1 course penetration on shell or gravel paving 40,000 sq.yd. streets, 2 main traveled roads through town. $70,000. F. J. Von Zuben, D. Wagoner Bldg., Fort Worth, engr.

Washington—July 14, by S. J. Humes, dir. hys., Olympia, clearing, grading, drainage structures, crushed stone surfacing 7.4 mi. State Rd. 5, Oak Flat to Carmack Bridge, Emergency Federal Aid Project 161-B, Yakima Co.—redecking existing bridge over Cowlitz River at Toledo on State Rd. 1, Lewis Co.—bituminous seal coat surfacing 31 mi. State Rd. 9, end of pavement east of Port Angeles, to Discovery Bay, Clallam and Jefferson Counties—6 mi. State Rd. 5, Mountain Tea House South, Pierce Co.

S. D., Yankton—July 1, by State Bd. Charities & Corrections, G. Hill, secy., at office G. S. Adams, Yankton State Hospital, ward for men, Yankton State Hospital. W. J. Dixon, Mitchell, archt.

CONTRACTS AWARDED

Ala., Birmingham—Jefferson Co. Comn., grading 1¼ mi. roadway, connecting 3rd Ave. N. with Brighton Rd., between city limits at Vinesville and Wilkes Station, convict labor, $30,000.

Colorado—State Hy. Dpt., Denver, gravel surfacing 4.965 mi. Federal Aid Project 71-C between Durango and Mancos, La Plata Co., to F. Finger & Son, 1431 Glenarm St., Denver, $86,147; 2.615 mi. Federal Aid Project 254-AR-1 BR-1 and CR-1, in Byers Course west of Hot Sulphur Springs, Grand Co., to F. L. Hoffman, D. A. C. Bldg., Denver, $165,373.

Ia., Dubuque—For 6 in. concrete paving McCormick St. from Delhi to Grace Sts., to T. Flynn Coal Co., Dubuque, $4,421—Algona St. from Grandview to St. Joseph Sts., to J. F. Lee Paving Co., Dubuque, $8,798—57 lighting standards and street lighting system on Iowa St., to Kennelly Electric Co., 730 Main St., $12,550. Grand total $25,769.

Kansas — State Hy. Comn., Court House, Fredonia, to P. F. Connelly Paving Co., Little Rock, Ark., bituminous blotter treating 9.31 mi. roads in Allen Co. $5,755; 5.013 mi. Anderson Co. $410; 7.9 mi. Labette Co. $1,363; 2.684 mi. Linn Co. $2,165; 3.5 mi. Montgomery Co. $1,880; 9.5 mi. Wilson Co. $5,535, chats surfacing 15.7 mi. Chautauqua Co. $6,313; 12.2 mi. Marion Co. $4,646; 12 mi. Franklin Co. $5,568; 10 mi. Greenwood and Coffey Counties, $8,156; sand gravel surfacing 2.295 mi. Neosho Co. $2,462—to Cook & Cone, Ottawa, bituminous blotter treating 22.5 mi. Coffey Co. $8,882; 2.647 mi. Greenwood Co. $2,249; chats surfacing 3 mi. Franklin Co. $2,115—to Dubois & Co., Pittsburg, 4.1 mi. Crawford Co. $1,099; 15 mi. Woodson Co. $6,180; 3 mi. Neosho Co. $1,170; 6.5 mi. Wilson Co. $2,835—to F. H. Freesto, Pittsburg, 4.5 mi. Allen Co. $1,539; 2.6 mi. Woodson Co. $1,076; 5 mi. Linn Co. $4,212; 3 mi. Greenwood Co. $1,242—to G. Ross Asphalt Co., Kansas City, Mo., 3.079 mi. Anderson Co. $2,405; 1.613 mi. Wilson and Allen Counties $595—to Western Bridge & Constr. Co., 3867 Leavenworth St., Omaha, Neb., bituminous blotter treating 10.207 mi. Woodson Co. $9,773; 7.87 mi. Greenwood Co. $6,900 —to W. F. O'Brien, St. Paul, 10 mi. Babette Co. $2,880—to Thogmartin & Reis, Ft. Scott, 0.521 mi. Neosho Co. $263; drag line treating 4.5 mi. and bituminous retread surfacing 10 mi. Bourbon Co. $29,727 — to M. W. Watson, Topeka, bituminous blotter treating 15 mi. Wilson Co. $8,508; chats surfacing 15 mi. Coffey Co. $6,892—to W. D. Shay, McPherson, 12.7 mi. Greenwood and Wilson Counties $5,397; bituminous blotter treating 4 mi. Wilson Co. $695—to R. Tanner Paving Co., Tulsa, Okla., bituminous blotter treating (oil) 9.11 mi. Anderson Co. $3,608; 9.919 mi. Allen Co. $4,244; 7.87 mi. Greenwood Co. $3,346; 10.7 mi. Labette Co. $7,422; 3.5 mi. Montgomery Co. $1,472, 5 mi. Linn and Greenwood Counties $2,235; 10.207 mi. Woodson Co. $4,052; 27 mi. Wilson Co. $16,446 — to A. G. Sherwood, Independence, grading, drainage structures 0.23 mi. Montgomery Co. $7,542. Grand total $201,314. Noted June 4.

La., New Orleans—City Council, to Craven & Lang, New Orleans Bank Bldg., concrete curbing, warrenite bitulithic on concrete paving 5,900 sq.yd. Jackson Ave. from South Clairborne to South Galvez Sts., $28,110—4,950 sq.yd. Jackson Ave. from Baronne to Freret Sts. $26,610—to Southern Uvalde Rock Asphalt Co., New Orleans Bank Bldg., concrete cast curbing, bituminous concrete on 6 in. concrete paving 14,400 sq.yd. Jena St. from Magazine to Freret Sts. $57,160; 6,710 sq.yd. 2nd St. from La Salle St. to St. Charles Ave. $27,760; Uvalde rock asphalt on 8 in. concrete paving 9,390 sq. yd. North Galvez St. from St. Bernard Ave. to Elysian Fields, $55,450. Grand total $195,090. Rejected bids concrete guttering, bituminous concrete paving 3,751 ft. Montegut St. from St. Claude Ave. to North Galvez St., 26 ft., and drainage structures, sidewalks, paving 1,151 ft. Broad Pl. from Fontainbleau Dr. to Lowerline, 36 ft. Noted Feb. 5.

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Streets and Roads (Continued)

Massachusetts—Dpt. P. Wks., State House, Boston, rein.-con. and bituminous macadam dual type paving 31,290 ft. hy and 2 span steel stringer and concrete bridge and rein.-con. extensions to 2 bridges, Andover, Reading and North Reading, to P. J. Holland, 24 Ames St., Lawrence, $368,055; bituminous macadam paving 10,093 ft. hy. and steel, concrete stringer bridge over Boston & Maine R.R. Groton and Pepperell, to D. & C. Constr. Co., 45 Harrison Ave., Fitchburg, $80,800. Noted June 11.

Mass., Malden (br. Boston)—Sheet asphalt repaving Lebanon St., separate contracts, $25,000.

Minnesota—State Hy. Dpt., St. Paul, concrete paving 128,450 sq.yd. State Projects 43-B and 3-60 Sect. 1 and S.P. 20-27, to Thornton Bros. Co., 1343 Dayton Ave., St. Paul, $142,343—grading 148,000 cu.yd. State Project 9-22 Div. B, to Erickson-Johnson Constr. Co., 3631 22nd Ave. S. Minneapolis, $28,998—500,000 cu.yd. State Project 11-39, Sect. 2, to Winston Bros. 1470 Northwestern Natl. Bank Bldg., Minneapolis, $192,687—289,000 cu.yd. State Project 25-22, Sect. 3, to Volden Bros., Milan, $51,588. Grand total $415,616. Noted June 4.

Minn., Duluth—St. Louis Co., Court House, to J. W. Salo Contg. Co., 1215 East 11th St., one course concrete paving 1.88 mi. Co. Job 54-1, Rd. 54 $41,265—1.48 mi. Co. Rd. 700-1, Rd. 700 $36,701; 4.07 mi. Co. Job 3-1, Rd. 3 $88,674. Grand total $166,640.

Mo., St. Louis—Bd. P. Wks., City Hall, asphalt paving 5,610 sq.yd. 12th Blvd., to Crean & Scott Constr. Co., 1242 Sublette Ave., $42,548 10,640 sq.yd. Gravois Ave., to Trinidad Asphalt Mfg. Co., 600 South Theresa Ave., $67,804—27,060 sq.yd. Gravois Ave. to Central Paving & Constr. Co., 411 North 7th St., $155,088—7,325 sq.yd. Gravois Ave. to Webb-Boone Paving Co., 5103 Fyler Ave., $53,350—4,250 sq.yd. Utah St. and 1,655 sq.yd. Tam Ave., to Asphalt Paving Co. of St. Louis, 1328 Sublette Ave., $28,458 and $10,469 respectively—4,590 sq.yd. University Circle, to C. A. Moreno Co., Syndicate Trust Bldg., $22,608—warrenite bitulithic paving 1,250 sq.yd. Tholozan St., to Granite Bituminous Paving Co., Ry. Exch. Bldg., $8,047—vibrolithic concrete paving 2,995 sq.yd. Bulwer St., to Parkinson Bros. Constr. Co., 3237 Carter Ave., $11,221—concrete paving 4,415 sq.yd. Lansdown Ave., to A. Lewald, Inc., 5473 Delmar Blvd., $9,232—concrete macadam shoulders 4,325 sq.yd. Chippewa Ave., to Eyermann Contg. Co., 1210 South Grand Blvd., $8,876—13,550 sq.yd. Morganford Rd., to W. A. Riley Constr. Co., 6221 Olive Blvd., $31,446—sewers in Sharp Ave., to Grant & Meinert, Fullerton Bldg., $5,236. Grand total $454,383. Noted May 21.

N. J., Paterson — Grading, bituminous macadam paving Pennsylvania Ave., to Union Building & Constr. Co., 150 Prospect Ave., Passaic, $24,186 — Totowa Ave., to Franklin Constr. Co., 349 Highland Ave., Passaic, $11,496.

N. Y., Long Island City—G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., to Meehan Paving Co., 90 West St., New York, asphalt paving 166th St., $11,516; 38th Ave. $7,543; 28th St., $15,538—to Brugel Contg. Co., 1154 Cypress Ave., Ridgewood, regulating 24th St. $7,572—to Borough Asphalt Co., 1301 Metropolitan Ave., Brooklyn, asphalt paving 110th St., $31,031; 71st St. $19,989; Atlantic Ave. $19,065; 68th St. $9,860—to Kurth & Brady, 95-19 126th St., Richmond Hill, regulating Jamaica Ave., $20,039. Grand total $142,153. Noted June 11.

N. Y., New York—H. Bruckner, pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., June 18, asphalt paving Mace and Gleason Aves., to Venetian Contg. Co., East Bay Ave., $6,191 and $33,485 respectively—Matthews Ave., to Bronx Asphalt Co., 819 Edgewater Rd., $11,759—granite block paving Park Ave., to E. T. Barry, 226-09 139th Ave., Laurelton, $61,612—sidewalks on Tilden St., to A. Caserta, 2442 Barnes Ave., $4,811 — Gunther Ave., to F. Gabrielle, 1382 Plimpton Ave., $4,672—grading Throop Ave., to A. Musumeci, 277 East 146th St., $6,217—repairing sidewalks on various streets to A. Mancino, $577. Grand total $200,419. Noted June 11.

N. Y., St. George—J. A. Lynch, pres. Richmond Boro, Boro Hall, cinder resurfacing Van Name St. and Prescott Ave., to Vanbro Constr. Co., 24 Elizabeth St., West New Brighton, $13,474 and $9,308 respectively. Noted June 11.

Ohio — O. W. Merrell, dir. hys., Columbus, rock asphalt paving 4.8 mi. hy., and waterbound macadam paving 3.9 mi. hy. Wyandot Co., to Fred Walton & Co., Upper Sandusky, $22,378 and $28,265 respectively—brick paving, not incl. furnishing, delivering brick 0.11 mi. Morrow Co., to John Frantz & Son, Sidney, $7,683—furnishing, delivering brick for above road to Dpt. Public Welfare, 9th and Oak Sts., Columbus, $2,859—concrete widening 1.55 mi. Auglaize Co., to Pence & Downing, Lakeview, $5,702—bituminous macadam paving 4.8 mi. Pickaway Co., to H. W. Curry & Co., Eaton, $29,954—2.9 mi. Putnam Co., to E. Hanefeld, Ottawa, $23,863—1.5 mi. Putnam Co., to C. E. Edgington, Findlay, $11,893—4 mi. Henry and Wood Counties and macadam paving 3 mi. hy. Fulton Co., to Mangerink Bros., Napoleon, $65,889 and $18,600 respectively—3 mi. Butler Co., to J. W. Weeks, Brookville, $16,516—2.9 mi. Coshocton Co., to N. P. Putnam, 20 East Broad St., Columbus, $21,452—widening, concrete and macadam paving 5.3 mi. Allen Co., to Henefeld & Schmenk, Ottawa, $55,603—5.3 mi. Crawford Co., to R. W. Rankin, Ashland, $39,520 — 8.4 mi. Greene Co., to Republic

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Asphaltic Paving Co. North Summit St. and Pennsylvania R.R., Dayton, $85,630—6.3 mi. Lorain Co., to General Asphalt Paving Co., 430 Janet Court, S. E., Canton, $60,818—2.1 mi. Preble Co., to C. J. Van Ausdall, Eaton, $13,221—0.2 mi. Summit Co., to Costigan-Shroyer Constr. Co., 106 North Main St., Akron, $5,285. Grand total $515,131. Noted June 18.

O., Cleveland — Cuyahoga Co., sandstone curbing 10,710 lin.ft., rock excav. 42,900 cu.yd., concrete paving 32,750 sq.yd. Wolf Rd. 4 and 5, to Highway Constr. Co., Builders Exch. Bldg., Cleveland, $132,970.

Okla., Fairview — Major Co., grading 8 mi. Project 404, Sect. A, to C. Merveldt & Son, El Reno, $14,140—drainage structures 8 mi. Project 404, Sect. AA, to Hileman & Sons, Covington, $8,379—grading, drainage structures 8 mi. Project 404, Sect. H, to Asplund Constr. Co., Enid, $27,213—grading 4 mi. Project 2, Sect. A, to J. D. White & Sons, Nowata, $4,392—4 mi. Project 6, Sect. A and 4 mi. Project 7, Sect. A, to J. A. Martin, Fairview, $5,184 and $7,507 respectively. Grand total $66,815.

Okla., Oklahoma City—See "Railways" under "Oklahoma."

Pennsylvania — State Hy. Dpt., Harrisburg, grading, waterbound macadam surfacing 53,074 sq.yd. Route 353-1, Lycoming Co., to Corrado & Galliardi Constr. Co., Connellsville, $125,430. Noted May 23.

Pennsylvania — State Hy. Dpt., Harrisburg, grading, drainage structures, waterbound macadam surfacing 63,432 sq.yd. Route 656-2, Bucks Co., to J. Ciccone, 5732 Westminster St., Phila., $118,820; grading, drainage structures, concrete surfacing 35,589 sq.yd. Route 69 Spur, Westmoreland Co., to State Constr. Co., New Kensington, $107,736. Noted May 14.

Pa., Pittsburgh—E. G. Lang, Dpt. P. Wks., City-County Bldg., to Harrison Constr. Co., 2101 Sidney St., grading, curbing, paving Shady Ave. $54,125; Millerton St. from Termon St. to Ohio River Blvd. $8,810; Wilkesboro Ave. from Termon to Berea Sts. $4,586—to Parkview Constr. Co., 373 Boquet St., repaving Pennsylvania Ave. and 32nd St. $17,371—to Welsh Constr. Co., 2331 Los Angeles Ave., repaving 5th Ave. $13,529—to Schenley Constr. Co., 40 Boundry St., Bader St. from Demasto to Sereme Sts. $5,197. Grand total $103,618.

South Carolina—State Hy. Dpt., Columbia, to C. G. Fuller, Barnwell, bituminous surfacing 18.95 mi. hy. Beaufort Co., $141,374; 27.75 mi. Chesterfield Co., $74,342; 15.42 mi. Greenwood Co., $51,091—to L. M. Gray, Gainesville, Fla., 34.49 mi. Clarendon and Williamsburg Counties, $259,665 — to R. B. Tyler, Louisville, Ky., 11.14 mi. Laurens Co., $58,483; 15.51 mi. McCormick Co., $79,493; 7.46 mi. Newberry Co., $22,960; 16.4 mi. Spartanburg Co., $58,510—to Gibson Constr. Co., Walterboro, sand clay surfacing 9.85 mi. Bamberg Co., $60,614—to K. V. Johnson, Edgefield, topsoiling 0.6 mi. Saluda and Newberry Counties, $15,009 — to H. E. Wolfe Constr. Co., St. Augustine, Fla., concrete paving 12.77 mi. Aiken and Barnwell Counties, $181,697; 19.11 mi. Georgetown Co., $296,809—to W. F. Bowe, Jr., Augusta, Ga., 6.83 mi. Lancaster Co., $123,876—to Wilmore Paving Co., Middletown, O., 18.73 mi. Orangeburg and Dorchester Counties, $265,352. Grand total $1,689,275. Rejected bids on June 9, concrete paving 18.28 mi. hy. Pickens Co., will readvertise, bidding for surface treating. Noted June 4.

Utah—State Hy. Dpt., Salt Lake City, concrete surfacing 2.57 mi. State Hy. through Lehi, Utah Co., to Christensen & Gardner, Salt Lake City, $82,122. Est. $90,620. Noted June 4.

Utah—State Road Comn., Salt Lake City, concrete paving 1.57 mi. and constructing 84 ft. concrete bridge on state hy. between North Ogden and Hot Springs, also section road in Brigham City, Federal Aid Project 32 and State Aid Project 318, Weber and Box Elder Counties, to O. Bundy, Ogden, Utah, $62,684. Est. $69,856. Noted June 18.

Virginia—State Hy. Dpt., Richmond, grading, drainage structures, macadam surfacing 35,450 sq.yd. road in Giles Co., to S. E. Finley, 292 North Ave. N. W., Atlanta, Ga., $25,388—26,735 sq.yd. Frederick Co., and 2.011 mi. Smyth Co., to Pendleton Constr. Co., Wytheville, $38,033 and $11,972 respectively — clearing, grubbing, grading, drainage structures, gravel surfacing 724 sq.yd. bridge approaches at Lake Smith, Princess Anne Co., to Sanderson & Son, Centerville, $3,679. Grand total $79,072. Noted June 11.

Washington — S. J. Humes, dir. State Hy. Olympia, grading, concrete paving 37,960 sq.yd. Grays Harbor and Thurston Counties, to Puget Sound Bridge & Dredging Co., 2929 16th Ave. S. W., Seattle, $73,229 — cleaning, grubbing, overhead crossing, crushed stone surfacing 2,830 cu.yd. Clallam Co., to Welfare & Govan, Inc., Box 105, Olympia, $90,747 — bridge over Chehalis River, at Pe Ell, Lewis Co., to Alexander & McNeil, Mount Vernon, $29,283. Grand total $193,259. Noted June 4.

Wash., Seattle—Bd. P. Wks., grading, paving, Div. 1, Albro Pl., et al., to Western Constr. Co., Seaboard Bldg., $102,231; concrete viaduct, Div. 2, Albro Pl., et al., to R. J. Odman, 2114 Westlake Ave., $199,825.

Wash., Yakima—Comrs. Yakima Co., paving 3 mi. Selah-Gore Rd., to Midstate Contg. Co., Yakima, $76,743. Est. $72,000.

Wisconsin—State Hy. Comn. and Hy. Coms. Eau Claire and Clark Counties, Eau Claire, concrete paving 9.642 mi. Eau Claire-Fall Creek Rd., Eau Claire Co., to Stack & Mekenzie, Superior, $271,062; 7.529 mi. Granton-Marshfield Rd., Clark Co., to Jorgensen Constr. Co., Denmark, $166,050. Noted June 4.

Wis., Milwaukee—Dpt. P. Wks., improving North 25th St., to Czerwinski Constr. Co., South 16th and Morgan Ave., $13,557—North 31st St., to Bodemann Constr. Co., 2803 North 55th St., $4,748—East Center and West Mitchell Sts., to White Constr. Co., 110 East Wisconsin Ave., $22,722 and $9,061 respectively—West Michigan St., to W. F. Hunt, 757 North Bway., $22,252—North 76th and West Capitol Dr., to N. Harris, 830 East Mason St., $2,014 and $3,358 respectively. Grand total $77,712.

EXCAVATION, DRAINAGE, IRRIGATION, LEVEES, RIVER AND HARBOR

PROPOSED WORK

Mass., Weymouth—Town, Bd. Selectmen, W. A. Cornell, chn., soon takes new bids concrete seawall, curbing, north of Fore River, $25,000. Former bids rejected. Noted June 11.

BIDS ASKED

Ala., Birmingham—July 17, by A. J. Hawkins, city engr., Sect. 2 Valley Creek Drainage Project from 7th St. S. W. to 18th St. S. W., incl. 110,000 cu.yd. earth and 37,000 cu.yd. rock excav.

CONTRACTS AWARDED

Louisiana — Bd. State Engineers, 207 New Orleans Court Bldg., New Orleans, drainage borrow pits in Pontchartrain Levee Dist., incl. 60,000 cu.yd. excav., to O. O. Ogden, Jr., Baton Rouge, at $0.1474 per cu.yd.; drainage borrow pits and restoring wave wash in Lafourche Levee District from Donaldsonville to Raceland, incl. 60,000 cu.yd. excav., to Acme Constr. Co., Point a la Hache, $0.199; drainage borrow pits in Grand Prairie Levee Drainage District from Ostrica to Manchello, Plaquemines Parish, incl. 70,000 cu.yd. excav., to McWilliams Dredging Co., Canal Bank Bldg., New Orleans, $0.159; Reid-Bedford Canal 2, incl. 22,000 cu.yd. excav., and constructing Grinnell Lake-Bayou Roundaway Drainage Canal, incl. 223,000 cu.yd. excav., both Madison Parish, to Midland Constr. Co., Clarksdale, Miss., $0.778. Noted June 11.

N. Y., Syracuse—New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., New York, grading area for Peat Street Coach and Team Yards, to Walsh Constr. Co., Herald Bldg., Syracuse, $156,298. Est. $260,277. Noted Apr. 9.

Ont., Byng Inlet—N. Desjardins, secy. Dpt. P. Wks., Ottawa, dredging 33,900 cu.yd. sand, clay and gravel, to Randolph McDonald Co. Ltd., Toronto, $92,000. Noted May 21.

Bond Elections

Coming Bond Elections

Sewage Treatment Plant—Bemidji, Minn., July 28, $90,000. Wolff & Coates, 903 Globe Bldg., St. Paul, Engrs.

Sewers and Street Impvt. — Memphis, Tenn., July 7, $1,350,000.

Light and Power Plant—Lake Mills, Ia., July 1, $90,000. J. D. Kent, City Clk.

Hospital — Ft. Worth, Tex., Tarraut County, petitioning for bond election, $1,000,000.

Schools—Santa Monica, Calif., $1,000,000.

Bonds Voted

Storm Sewers — Miami, Ariz., $95,000. D. Travaini, City Engr.

Fall Bridge—Omaha, Neb., $2,000,000.

Irrigation System—San Benito, Tex., Cameron County Waterworks Impvt., Dist. 16, W. M. Heath, Consult. Engr. $210,000.

City Hall—Auditorium and Fire Station, Big Springs, Tex. $200,000.

Bonds Defeated

Waterworks and Distribution System—Strong City, Kan., D. C. Moehring, Engr.

Waterworks Impvts. — Redwood Falls, Minn., $34,000.

FEDERAL GOVERNMENT

PROPOSED WORK

Ariz., Yuma—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office. $190,000 appropriated.

Calif., Monterey — BREAKWATER — U. S. Eng., Customhouse, San Francisco, 150,000 tons rock and concrete cap for rock mound breakwater to protect Monterey Harbor.

Calif., Richmond—TANK—Con. Q. M., March Field, soon takes bids gasoline storage tank. $15,000.

Calif., San Francisco — POST OFFICE — Treas. Dpt. at office Sup. Archt., plans by G. W. Kelham, 315 Montgomery St., U. S. Post Office addition, 7th and Mission Sts. $750,000.

Fla., Daytona Beach—POST OFFICE—Treas Dpt. at office Sup. Archt., U. S. Post Office, Beach St. $285,000. Noted July 17, 1930.

Ill., Chicago — REMODELING, etc. — Treas. Dpt. at office Sup. Archt., plans by Thielbar & Fugard, 520 North Michigan Ave., remodeling, extending buildings at U. S. Marine Hospital.

Ind., Mount Vernon—FEDERAL—Treas. Dpt., at office Sup. Archt., bids in July, rein.-con. post office.

Federal Government (Continued)

Ia., Dubuque—POST OFFICE, etc.—Treas. Dpt. at office Sup. Archt., plans by Proudfoot, Rawson, Souers & Thomas, 810 Hubbell Bldg., Des Moines, and H. A. Kennison, assoc. archt., Dubuque, U. S. Post Office and Court House. Noted Apr. 30.

Ia., Sioux City—POST OFFICE—Treas. Dpt. at office Sup. Archt., plans by Beuttler & Arnold, 407 Insurance Exch. Bldg., Sioux City, and Proudfoot, Rawson, Souers & Thomas, 810 Hubbell Bldg., Des Moines, Ia., 4 story, basement, brick, steel, stone, 6th and Douglas Sts. $775,000. J. A. Wetmore, Wash., D. C., acting sup. archt. Noted Apr. 16.

Mo., St. Louis—BANK PROTECTION—U. S. Eng., St. Louis, constructing bank protection on Mississippi River, 2,500 lin.ft. from Burnham Island to Commercial Point and 2,500 lin.ft. at Osborn Field.

N. Y., Albany—POST OFFICE, etc.—Treas. Dpt., at office Sup. Archt., plans by E. D. Litchfield, 578 Madison Ave., New York, and Gander, Gander & Gander, assoc. archts., 17 Steuben St., Albany, U. S. Post Office, Custom and Court House. To exceed $2,000,000. **Maturity after Sept. 1.**

Pa., Clearfield—POST OFFICE—Treas. Dpt. at office Sup. Archt., soon takes bids U. S. Post Office, 2nd and Pine Sts. $150,000. Noted Nov. 27.

Tex., Plainview—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office, $152,500 appropriated. **Maturity about Sept. 1.** Noted Sept. 11.

Tex., San Antonio—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office, Avenue E, North Alamo and Travis Sts. $1,600,000.

BIDS ASKED

Ark., Little Rock—POST OFFICE—Treas. Dpt. at office Sup. Archt., bids about July 15, U. S. Post Office. $1,435,000 appropriated. Noted Dec. 18.

California—ROAD—July 9, by C. H. Sweetser, dist. engr. Pub. Rds., 461 Market St., San Francisco, grading 3.717 mi. Sect. A, Route 79, Morgan Summit-Morgan Springs Natl. Forest Hy., Lassen Natl. Forest, Tehama Co.—3.66 mi. Sect. B, Deer Creek Natl. Forest Hy., Route 21, Lassen Natl. Forest, Tehama Co.

California—ROAD—July 14, by C. H. Sweetser, dist. engr. Pub. Rds., 461 Market St., San Francisco, grading 1.266 mi. Sect. A, Route 68, Mill Creek Natl. Forest Hy., San Bernardino Co.

Calif., Stockton—DREDGING—July 14, by U. S. Eng., Calif. Fruit Bldg., Sacramento, 1,435,000 cu.yd. in 26 ft. Stockton channel prism from Black Slough to west side Spud Island, on San Joaquin River, 10 mi. from here. Noted June 18.

Colorado — ROAD — July 5, by Pub. Rds., Custom House, Denver, grading 7.827 mi. Willow Creek Pass Natl. Forest, Hy., Arapahoe Natl. Forest, Grand Co. A. E. Palen, dist. engr.

D. C., Wash.—HEALTH SERVICE BUILDING—Aug. 3, by Treas. Dpt. at office Sup. Archt., constructing (except founds. and elevators) U. S. Public Health Service Building; adv. E. N.-R. July 2.

Louisiana—DREDGING—July 28, by U. S. Eng., 1st New Orleans Levee Dist., Poland and Dauphine Sts., New Orleans, 8,744,600 cu.yd. in Louisiana and Texas Intracostal Waterway, Mississippi River-Atchafalaya River Sect. from Bayou Blue to Bayou Chene; adv. E. N.-R. July 2.

N. J., Newark—POST OFFICE, etc.—Treas. Dpt. at office Sup. Archt., bids about Sept. 1, general contract 4 story, basement, brick, steel post office and court house, Franklin and Washington Sts. $6,150,000. W. E. Lehman & G. Oakley, Totten, 972 Broad St., archts. J. A. Wetmore, c/o Owner, assoc. archt. Noted Apr. 30.

N. Y., Mineola—POST EXCHANGE—July 23, at office Con. Q. M., Mitchel Field, 4 air corps hangars, 1 air corps machine shop, 1 air corps assembly shop, 1 headquarters and operations building, 1 parachute building, paint oil and dope warehouse, 1 Q. M. warehouse, 1 Q. M. garage, 1 Q. M. maintenance building, 1 post exchange building, 2 boiler houses, 1 fire station and guard house, at Mitchel Field; adv. E. N.-R. July 2. Noted June 18.

N. D., Portal — INSPECTION STATION — July 24, by Treas. Dpt. at office Sup. Archt. constructing U. S. Inspection Station; adv. E. N.-R. July 2.

Pa., Erie—POST OFFICE—July 7, by Treas. Dpt. at office Sup. Archt., 1 and 2 story, basement, 116 x 198 ft., brick, stone, terra cotta, rein.-con., steel, 13th and 14th Sts. $397,000. Noted June 25.

Wyoming — ROAD — July 6, by Pub. Rds., Custom House, Denver Co., grading 5.225 mi. Centennial-Saratoga Natl. Forest Hy., in Medicine Bow Natl. Forest, Albany and Carbon Counties. A. E. Palen, Denver, Colo., dist. engr.

CONTRACTS AWARDED

Arizona—ROAD—Pub. Rds., Phoenix, grading, draining 20.034 mi. Pine-Winslow Natl. Forest Rd. in Coconino Natl. Forest, Cococino Co., to Hodgman & MacVicar, Pasadena, Calif., $95,399. Est. $117,448.

Arizona—SPILLWAY GATES—U. S. Indian Serv., Los Angeles, Calif., installing 6 spillway gates at Coolidge Dam, to Bent Bros., Inc., 418 Pecan St., Los Angeles, Calif., $87,000; emergency outlet gates at Coolidge Dam, to Kyle Steel Constr. Co., Los Angeles, Calif., $19,540.

Colorado—ROAD—Pub. Rds., Denver, Colo., surfacing roadbed 18.4 mi. North and South Hy., Mesa Verde Natl. Park, to A. O. Peabody, Denver, Colo., $128,735. Noted June 4.

Idaho—ROAD—Pub. Rds., Ogden, Utah, grading, draining, surfacing 22.6 mi. Soda Springs-Freedom Natl. Forest Rd., Caribou Natl. Forest, Caribou Co., to Utah Constr. Co., Ogden, Utah, $48,620. Est. $58,560. Noted June 10 Daily.

Ind., Fort Benjamin Harrison—HOSPITAL—Con. Q. M., hospital addition, to American Constr. Co., 1201 East Georgia St., Indianapolis, $127,097. Noted Apr. 30.

Louisiana—DREDGING—U. S. Eng., 1st New Orleans Levee Dist., Poland and Dauphine Sts., New Orleans, 4,988,000 cu.yd. in Louisiana-Texas Intracoastal Waterway between Atchafalaya River and Bayou Gregorie, to McWilliam Dredging Co., Canal Bank Bldg., New Orleans, $302,830. Noted May 7.

Mass., Taunton — DREDGING — U. S. Eng. Office, Providence, R. I., 323,600 cu.yd. in Taunton River, to Atlantic Gulf & Pacific Dredging Co., 21 Park Row, New York, at $0.1689 per cu.yd. Noted May 21.

Mich., Selfridge Field — QUARTERS — Con. Q. M., 2 field, 8 company officers and 10 double non-commissioned officers quarters, to Atkin & Stock, Inc., 14915 Grand River Rd., Detroit, $222,143; sidewalks, steps and pylons, to Van Pamel & Gekiers, Mount Clemens, $3,900; headquarters, operations and parachute building, to A. W. Kutsche Co., 2111 Woodward Ave., Detroit, $60,993. Grand total $287,036. Noted Apr. 16 and 30.

Mississippi, Arkansas and Louisiana—LEVEE — U. S. Eng., Box 667, Vicksburg, Miss., 134,600 cu.yd. levee work in Mississippi River, to W. T. Lorance, Memphis, Tenn., $30,554, 687,800 cu.yd., to E. S. Johnson Dredging Co., Chicago, Ill., $106,540; 1,605,700 cu.yd., to T. W. Roach, Memphis Savings Bank Bldg., Memphis, Tenn., $304,598; 1,120,000 cu.yd., to Lowrance Bros. & Co., Driver, Ark., $222,899; 333,000 cu.yd., to Yale & Reagan and Benson Kaiser Co., Merchants Laclede Bldg., St. Louis, Mo., $81,252; 318,400 cu.yd., to E. T. Clark Co., Inc. and Delta Constr. Co., Lake Cormorant, Miss., $45,372; 5,340,200 cu.yd., to E. T. Powers Constr. Co., West Palm Beach, Fla., $751,977; 651,300 cu.yd., to R. E. Cotton Co., Newellton, La., $126,352; 1,070,000 cu.yd., to J. J. McCaughey Co. and States Contg. Co., 205 West Wacker Dr., Chicago, Ill., $208,135. Grand total $1,877,679. Noted May 21.

Nevada—ROAD—C. H. Sweetser, dist. engr. Pub. Rds., San Francisco, Calif., grading 4.164 mi. Glenbrook Natl. Forest Rd., Douglas Co., and 3.125 mi. Lake Tahoe Natl. Forest Rd., Washoe Co., to Nevada Contg. Co., Fallon, $73,995 and $27,987 respectively. Noted May 21.

N. Y., Buffalo—DIESEL ENGINE GENERATOR SET—U. S. Eng., 1 complete diesel engine generator set, to Winton Eng. Corp., 2116 West 106th St., Cleveland, O., $33,935. Noted May 7.

N. Y., Mineola—FUELING SYSTEM—Con. Q. M., gasoline fueling system, to Aqua Systems, Inc., 2 Lafayette St., New York, $9,623.

N. Y., Plattsburg—MESSES and KITCHENS—Conn. Q. M., Plattsburg, Barracks, messes and kitchens, to Smythe & Co., 1416 F St. N. W., Wash., D. C., $74,924. Noted Apr. 30.

Oregon—ROAD—Pub. Rds., Portland, grading, paving 2.507 mi. Siletz River Hy., U. S. Forest Rd., Lincoln Co., to Goodwin & Kellogg, Portland, $59,901.

Tex., Dryden — AIRWAYS OPERATIONS BUILDING, etc.—Con. Q. M., airways operations office building, gas and oil storage tanks, pump house, generator room, fueling pit, to Southwest Constr. Co., Del Rio, $7,350.

Tex., Randolph Field—INCINERATOR—Con. Q. M., 5 ton natural incinerator, to Kenneth L. Colburn, Inc., 385 East Green St., Pasadena, Calif., $3,700. Noted Mar. 19.

Va., Arlington—ADMINISTRATION BUILDING, etc.—Con. Q. M., Arlington Cemetery, administration building, potting house, heating plant and greenhouse, Arlington Cemetery, to L. T. Turner, Wash., D. C., $39,870; superintendent's cottage, to W. W. Keenan & H. R. Graves, Charlottesville, $11,937.

Va., Fort Monroe—SEWER, etc.—Con. Q. M., 12 in. trunk sewer, storm drain, water connections, to J. P. Mahon & Co., Essex Bldg., Norfolk, $5,803. Noted Apr. 16.

Va., Langley Field — FILLING, etc. — Con. Q. M., filling and grading Langley Field, to Tunsall-Johnson Co., Citizens Bank Bldg., Norfolk, $5,400. Noted May 21.

W. Va., Huntington—DREDGING—U. S. Eng., 161,000 cu.yd. in Ohio River, to Dravo Contg. Co., Neville Island, Pittsburgh, Pa., $76,415. Noted May 7.

T. H., Honolulu—BARRACKS—Con. Q. M., 3 barracks buildings, to Ames & Wells Ltd., Honolulu, $409,663. Noted Mar. 12.

France, Paris — EMBASSY — Chief Foreign Buildings, State Dpt., Wash., D. C., embassy, to Hegeman Harrison Co., 360 Madison Ave., New York, $1,297,000. Est. $1,600,000. Noted May 7.

RAILWAYS

CONTRACTS AWARDED

Indiana—Illinois Central R.R. Co., 135 East 11th Pl., Chicago, Ill., A. F. Blaess, ch. engr., installing "Y" switch, connecting with Belt R.R. Elevation at Meridian St. in Indianapolis, $40,000. Owner builds. City and Marion Co. will share cost.

Oklahoma — Atchison, Topeka & Santa Fe R.R. Co., 80 East Jackson Blvd., Chicago, Ill., G. W. Harris, ch. engr., grading, track elevation work through Oklahoma City, incl. 600,000 cu. yd. fill, to L. Sanders, Tradesmen's Bldg., Oklahome City, $240,000. Est. $250,000. Noted June 4.

GRADE CROSSINGS

PROPOSED WORK

N. Y., Afton—Delaware & Hudson R.R. Co., J. MacMartin, ch. engr., Albany, soon takes bids eliminating Maple Street Crossing. $208,000. Noted Dec. 1, 1929.

N. Y., Cortlandt — New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., New York, reconstructing hy. bridge carrying Croton River-Peekskill County Hy. over tracks, Westchester Co. $88,600.

N. Y., Hillburn—Erie R.R. Co., G. S. Fanning, ch. engr., 50 Church St., New York, eliminating grade crossing on Suffern Village-Hillburn Village State Hy. $247,100.

N. Y., Ithaca—Lehigh Valley R.R. Co., G. T. Hand, ch. engr., 143 Liberty St., New York, eliminating School House and Burtts Crossings. $163,000. Noted Dec. 19, 1929.

N. Y., Mexico—New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., New York, eliminating crossing on Mexico-Union Square State Hy., Mapleview Station. $101,700.

CONTRACTS AWARDED

N. Y., Cayuga—Lehigh Valley R.R. Co., G. T. Hand, ch. engr., 143 Liberty St., New York, eliminating Decker Crossing, Schuyler Co., to J. J. Higgins, Waverly, $41,194; furnishing, delivering structural steel, to McClintic-Marshall Co., 39 Bway., New York, $16,758. Noted Jan. 8.

N. Y., Savannah—New York Central R.R. Co., F. B. Freeman, ch. engr., 466 Lexington Ave., New York, eliminating Main St. Crossing, to Walsh Constr. Co., Herald Bldg., Syracuse, $124,316. Est. $192,016.

N. Y., Unadilla—Delaware & Hudson R.R. Co., J. MacMartin, ch. engr., Albany, eliminating Potters Crossing, to DiNella Bros. Co., Union Trust Bldg., Pittsburgh, Pa., $82,111. Est. $129,768. Noted May 14.

DAMS

PROPOSED WORK

Calif., Pasadena—See "Waterworks."
Mass., Attleboro—See "Waterworks."
Que., Lake St. John—Price Bros. Ltd., Quebec City, dam on Little Mistook River in Garnier Twp. Est. $250,000.

PIERS AND WHARVES

BIDS ASKED

Calif., San Diego—PIER—See "Buildings—Unclassified."

CONTRACTS AWARDED

La., Lake Charles — WHARF SHEDS — Bd. Comrs. Lake Charles Harbor Terminal Dist., Constructing Wharf 3 and Sheds 4 and 5, to P. Oliver & Son, Inc., Lake Charles, $444,000. Noted June 4.

N. Y., New York — PIER TERMINALS — New York & Porto Rico Line, subsidiary of Atlantic, Gulf & West Indies Line, Pier 13, East River pier terminals, Docks 15 and 16, East River, to Robbins Ripley Co., 50 Church St. Est. $300,000.

AIRPORTS

PROPOSED WORK

Minn., Little Falls—State, E. A. Walsh, adj. genl., 108 State Capitol, St. Paul, and U. S. Property & Disbursing Officer, St. Paul Park, plans by P. C. Bettenberg, Little Falls, 1 steel, fireproof hangar. $23,000.

Pa., McKeesport—H. R. Bazley, mgr. Bettis Field, 1 story, 80 x 120 ft. hangar for storage private planes, hardsurfacing extensive area. $50,000. Private plans.

Tex., Amarillo—City, c/o E. O. Thompson, air service shops, office, at English Airport or Municipal Field. $300,000.

GRAIN ELEVATORS

PROPOSED WORK

Utah, Nephi—GRAIN ELEVATOR—Farmers Natl. Grain Corp., 100,000 bu. grain storage building. $40,000.

POWER AND LIGHTING

PROPOSED WORK

Ariz., Douglass—See "Factories & Mills."
Ariz., Flagstaff — H. G. Laub & Associates, c/o H. G. Laub, Flagstaff, applied for franchise to install natural gas system. $75,000.
New Hampshire—New Hampshire Pub. Serv. Co., Concord, 14.6 mi. gas pipe, line between Laconia and Franklin. $150,000. J. W. Storrs, chn. building comn. Private plans.

BIDS ASKED

New York and New Jersey—July 20, by Port of New York Authority, J. F. Galvin, chn., 8090 8th Ave., New York, electrical equipment and installation on Kill van Kull Bridge, between Bayonne, N. J. and Port Richmond, N. Y.; adv. E. N.-R. July 2.

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Power and Lighting (Continued)

CONTRACTS AWARDED

Calif., Los Angeles — City, complete ornamental lighting system on Manchester Ave. between Wall St. and St. Andrews Pl., to D. S. McEwen, 3018 Lincoln Blvd., Ocean Park, $68,433.

Ia., Dubuque—See "Streets and Roads."

New York — Fire Dpt. J. J. Dorman, comr. Municipal Bldg., New York, portion underground fire alarm system in Ridgewood, to W. E. Blume, Inc., 1482 Bway., New York, $20,868. Noted June 4.

PARKS AND SPORTS

BIDS ASKED

Calif., Los Angeles—July 8, by Bd. Educ., 95 x 105 ft. brick, steel structure, incl. 60 x 75 ft. tile swimming pool, rein.-con. bleachers, 3,500 seating capacity, at Los Angeles High School.

N. J., Jersey City—July 7, by State Bd. Educ., State Normal School, grading, replacing top soil, sodding, concrete walks, steps, drains, catch basins, concrete sundial base, fountain, landscaping work at State Normal School. $25,000 or more. Brinley & Holbrook, 156 5th Ave., New York, landscape archts.

New York—July 7, by W. C. Martin, archt. and supt. School Buildings, Flatbush Ave. extension and Concord St., Brooklyn, improving site adjoining for playground at P. S. 99, Kew Gardens Rd. and 83rd Ave., Kew Gardens; and at P. S. 101, Slocum Crescent and Russel Pl., Forest Hill Gardens, for Bd. Educ., 500 Park Ave., New York.

N. Y., New York—July 7, by Park Bd., W. R. Herrick, pres. Park Dpt., Arsenal Bldg., Central Park, constructing war memorial and garden, incl. monumental work, landscape work, in vicinity Baychester Ave., Bronx and Pelham Parkway, in Pelham Bay Park, Bronx Boro.

HEATING AND VENTILATING

BIDS ASKED

N. Y., Brooklyn—July 7, by W. C. Martin, archt. and supt. School Buildings, Flatbush Ave. extension and Concord St., heating, ventilating, plumbing, drainage, electrical work and fixtures for P. S. 228 (David A. Boody Junior High School), Avenue S from West 4th to West 5th Sts.; and in P. S. 229, Benson Ave., from 14th Ave. to Bay 7th St., for Bd. Educ., 500 Park Ave., New York.

N. Y., New York—July 8, by Bd. Higher Educ., at office Secretary Hunter College, Park Ave. and 68th St., heating, ventilating, plumbing, electric wiring for gymnasium building of Hunter College, Bedford Park Blvd., Goulden, Jerome and Navy Aves.

N. Y., New York—July 8, by J. G. W. Greeff, comr. Hospitals, Municipal Bldg., heating, plumbing, electrical work, new floors in 1st, 2nd, 3rd floors tower, and repairing roofs of male dormitory, Metropolitan Hospital; roofing and sheet metal work on Girls' Industrial school, boys' industrial school, power house and laundry pavilion Randalls Island; replacing windows, part wings at City Hospital, Welfare Island.

Vt., Bennington—July 6, by State, General H. T. Johnson, Montpelier, 1 story, brick, steel, concrete heating plant at Soldier's Home, $50,000. F. L. Austin, 240 College St., Boston, Mass., archt. A. S. Kellogg, 585 Boylston St., Boston, Mass., engr. Noted June 25.

CONTRACTS AWARDED

Calif., San Francisco—Bd. Trustees of San Francisco War Memorial, (a) heating and ventilating (b) plumbing (1) 6 story, basement opera house (2) 4 story, basement legion memorial, to J. A. Nelson, 10th and Howard St. (a) $88,633 (a2) $133,227 — to Anderson & Rowe, 45 Belcher St., (b1) $80,915 (b2) $64,442. Grand total $367,217. Noted May 28.

UNCLASSIFIED

PROPOSED WORK

Oklahoma and Missouri—GAS PIPE LINE—Western Serv. Corp., Braniff Bldg., Oklahoma City, E. R. Ensberger, pres. and engr., preliminary plans natural gas pipe line from Oklahoma City to Tulsa, Okla., and to Joplin, Mo. $1,400,000.

BIDS ASKED

N. Y., Brooklyn—BULKHEAD—July 7, by J. McKenzie, comr. Docks, Pier A, foot Battery Pl., New York, steel sheet pile bulkhead at Columbia St., Erie Basin, Contr. 2017.

N. Y., New York—TREATED TIES, etc.—July 7, by Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., supply of treated ties and untreated rail protection boards for use in Rapid Transit Railroads.

Tex., Gilmer—STEEL TANKS—See "Contracts Awarded."

CONTRACTS AWARDED

Ind., Indianapolis—STORAGE BINS—Standard Paving Co., 1100 Burdsall Blvd., new steel storage bins for plant. $40,000. Owner builds.

N. J., Newark — ELEVATORS — Bd. City Comrs., City Hall, furnishing, installing electric elevators in city hall, to Otis Elevator Co., 19 Williams St., Newark, $69,490.

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N. Y., New York—RECTIFIER STATIONS—Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., underground rectifier stations Route 106, Sects. 1, 3, 5, 6, and 7, to Eastern Constr. Co., 110 West 40th St., $6,324. Noted May 28.

N. Y., New York—TURNSTILE EQUIPMENT—Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., installing turnstile equipment in 28 stations, to Vulcan Rail & Constr. Co., Maspeth, **$143,460. Noted May 28.**

Tex., Gilmer—STEEL TANKS—Humble Oil & Refining Co., Humble Bldg., Houston and Port Arthur, clearing 4 acre site for construction four 80,000 bbl. steel storage tanks, own forces, $600,000. Private plans.

MATERIALS

BIDS ASKED

LUMBER—**Minneapolis, Minn.**—July 7, by F. S. Gram, city purch. agt., various sized lumber for Bridge Dpt. $16,000.

ROAD GRAVEL—**Greenville, Miss.**—July 13, at office Bd. Mississippi Levee Comrs. 5,000 tons road gravel to comply with State Hy. standard specifications, f.o.b. cars Glen Allen. E. Kellner, secy.

CABLE—**New York, N. Y.**—July 8, by P. J. Dooling, comr. Purchase, Municipal Bldg., wire lead cable for Fire Dpt.

INORGANIC DUST, etc.—**New York, N. Y.**—July 8, by S. Levy, pres. Manhattan Boro, Municipal Bldg., 4,000 tons inorganic dust; 10,000 cu.yd. ¾ in. binder stone; 800,000 gal. asphaltic cement.

PAVING BLOCKS—**Tarentum, Pa.**—July 3, by Boro, J. F. Conroy, secy., 304 Lock St., 175 tons crushed air cooled blast furnace slag, 13,000 repressed 4 in. vitr. and 10,000 hillside paving blocks, c. E. Miller, Jenkins Arcade, Pittsburgh, engr.

CONTRACTS AWARDED

OILS, etc.—**Alameda, Calif.** — City Council, 2,000 bbl. Calol L 2 road oil and 2,000 bbl. Bitumals 95, to Heafey-Moore Co., 344 High St., Oakland, at $3.25 per bbl. Noted June 11.

CEMENT—**Trenton, N. J.**—Dpt. Institutions & Agencies, Trenton, 900 bbl. cement at Annandale for Reformatory, to B. W. Farrington, Allandale, $1,481. Noted May 28.

EQUIPMENT

BIDS ASKED

TRACTORS—**Grand Rapids, Minn.**—July 7, by Itasca Co., 1 or more 10-ton crawler type tractors.

HOISTING ENGINE—**Alpine, N. J.**—July 13, by Palisades Interstate Park Comn., L. Deyo, purch. agt., 141 Worth St., New York, 50 hp. gasoline hoisting engine, complete with 3 drum power hoist to Alpine Storehouse. $5,000. Private plans.

FIRE APPARATUS, etc.—**New York, N. Y.**—July 3, by P. J. Dooling, comr. Purchase, Municipal Bldg., motor fire apparatus to Fire Dpt.; tractor shovels to Dpt. Sanitation.

FOREIGN

Mexico, Matamoros — M. T. Khorn, L. Salinas, and R. R. Mungia, Matamoras, plans manufacturing plant for boll weevil poison, and constructing machines to disseminate poison.

Commercial Buildings

RESIDENTIAL

BIDS ASKED

Mass., Brighton (sta. Boston) — See "Contracts Awarded."

N. Y., Brooklyn—See "Contracts Awarded."

N. Y., Jackson Heights—See "Contracts Awarded."

N. Y., Long Island City — See "Contracts Awarded."

N. Y., Sunnyside—See "Contracts Awarded."

CONTRACTS AWARDED

Mass., Brighton (sta. Boston) — R. & R. Constr. Co., c/o L. E. Rudnick, 1945 Commonwealth Ave., Boston, 3 story, basement, brick, stone, steel, plain found., 90 Kilsyth Rd., separate contracts. $160,000. S. E. Moffie, 10 Tremont St., Boston, archt.

N. Y., Brooklyn—D. S. Smith Realty Co., 26 Court St., 6 story, 100 x 110 ft., 1247 Ocean Ave., separate contracts. To exceed $150,000.

N. Y., Brooklyn—Elpay Realty Corp., 26 Court St., 6 story, 90 Gatling Pl., separate contracts. $215,000. M. M. Weinstein, 93 Court St., archt.

N. Y., Jackson Heights — Jackson Terrace Homes, Inc., 31-13 30th Ave., Astoria, 2 story, 90th St. and 30th Ave., separate contracts. $200,000. L. Bailey, 295 6th Ave., Astoria, archt.

N. Y., Long Island City—Cayne Constr. Co., 3317 34th Ave., 6 story, basement, 137 x 141 ft., Skillman Ave. and 42nd St., separate contracts. $200,000. O. Fisher, 3417 34th Ave., archt.

N. Y., Long Island City — Dalesandro & Nackeusio, 30-06 31st St., 6 story, basement, 35th Ave. and 32nd St., separate contracts. $150,000. C. Wuest, 32-02 30th Ave., archt.

N. Y., Long Island City—Forty-One-Sixteen 51st Street Sunnyside Corp., 334 East 149th St., New York, 6 story, 83 x 106 ft., 50th St. and Skillman Ave., separate contracts. $180,000 Franklin, Bates & Heindsmann, 2526 Webster Ave., New York, archt.

N. Y., Long Island City—M. and W. Constr. Co., 1860 Bway., New York, 6 story, 90 x 200 ft., 43rd Ave. and 42nd St., separate contracts. $350,000. I. L. Cransman, 275 East Burnside Ave., archt.

N. Y., Sunnyside—Oliver Holding Corp., J. Polaskeli, pres., 46th St. and 43rd Ave., 6 story, 84 x 111 ft., 46th St. and 43rd Ave., separate contracts $200,000. Aronson & Hendrick, 125 45th St., New York, archt.

CLUBS

PROPOSED WORK

N. J., Newark—Italian Catholic Union Holding Co., c/o J. Centanni, archt., 142 Market St., 2 story, basement, brick, steel club house, Summer Ave. and D'Auria St. $150,000. Project in abeyance. J. Centanni, 142 Market St., archt. Noted May 14.

BIDS ASKED

N. J., Clifton—July 15, by Lee & Hewitt, archts., 152 Market St., Paterson, 2 story, basement, brick, steel addition to Elks Home, Clifton Ave., for Clifton Lodge B.P.O.E., F. A. Latimer, exalted ruler, 725 Clifton Ave. $150,000. Noted June 18.

HOSPITALS

CONTRACTS AWARDED

N. J., Hillsdale—Dpt. Institutions & Agencies, State Office Bldg., Trenton, housing units at New Jersey State Hospital, to Leroy Birkhead, Greenway Ave., Trenton, $54,200; patients building, to C. R. Heddon, 357 South Orange Ave., Newark, $186,000. Noted Mar. 5.

CHURCHES

PROPOSED WORK

N. J., Rutherford—Rutherford Congregational Church, C. E. Dunn, pastor, 23 Sunderland Ave., will not build 2 story, basement, brick, steel church, Union Ave. $150,000. Project abandoned. Architect not selected. Noted Feb. 12.

N. Y., New York — Paulist Fathers, J. B. Harney, pastor, 415 West 59th St., 6 story, basement, 100 x 110 ft., steel, granite rectory, 415 West 59th St. $150,000. Bids in. Project in abeyance. Maginnis & Walsh, Statler Bldg., Boston, Mass., archts. Noted May 21.

N. Y., Rome—Zion Episcopal Church, c/o H. Upjohn, archt., 70 East 45th St., New York, will not build church. $150,000. Project abandoned. Noted Oct. 2.

BIDS ASKED

N. J., Passaic — St. Peters & Pauls Polish Natl. Church, J. Wroflewski, pastor, 126 River Dr., taking bids general and separate contracts rebuilding 2 story, basement, brick, steel, Armory Park. $150,000. J. T. Camlet, 26 Piaget Ave., Clifton, archt. Noted June 4.

CONTRACTS AWARDED

N. Y., Garrison—Capuchin Franciscan Fathers of St. Joseph, 3 story, 42 x 191 ft. monestary, Bear Mountain Hy., to J. H. Eisele Co., 18 East 41st St., New York. Est. $150,000.

N. Y., New York—Metropolitan Temple, Inc., 91 7th Ave., 5 story, basement, mezzanine, tower, 68 x 100 ft. church, Sunday school, to Tidewater Building Co., 101 Park Ave. Est. $225,000. Noted May 14.

N. Y., Searsdale—Baptist Community Church, church, to Miller Reed, 949 Bway., New York. Est. $250,000. Excavation completed. Noted Jan. 1.

SCHOOLS

PROPOSED WORK

Del., Wilmington—Bd. Educ., rejected bids June 15, general contract 2 story, basement, 143 x320 ft., brick school, plain found. Will readvertise. Guilbert & Betelle, Chamber Commerce Bldg., Newark, N. J., archts. Noted June 11.

Mass., Kingston—St. Francis Xavier Mission, Island Creek, soon lets contract 3 story, basement, 65 x 105 ft., brick, concrete, boarding school. $150,000. L. J. Keimeg, 40 Princeton Rd., Elizabeth, N. J., archt.

Mass., Springfield—City, Z. E. Scott, supt. schools, plans by M. W. Maloney, 23 Pearl St., and takes bids in July, 2 story, basement, 60 x 170 ft., brick, steel, stone school, incl. manual training and domestic science departments, Haskin, Fisher and Lydia Sts. $150,000. Noted May 28.

N. J., Cliffside Park — Bd. Educ., Palisade Ave., 2 story, basement, brick, steel addition to School 3. $150,000. **Maturity probably soon.** Architect not selected.

N. J., East Orange—Bd. Educ., 19 Winans St., sketches by Guilbert & Betelle, 20 Branford Pl., Newark, Junior High School, 2 story, basement, brick, steel, North Clinton St. and Renshaw Ave. $250,000. Noted May 28.

N. J., Hasbrouck Heights—Bd. Educ., Administration Bldg., will not alter and build 2 story, basement, brick, steel addition to Lincoln School. $150,000. Project abandoned. Noted June 18.

N. J., Hasbrouck Heights—Bd. Educ., Administration Bldg., will not alter and construct 2 story, basement, brick, steel addition to Franklin School. $165,000. Project abandoned.

Schools (Continued)

N. J., Leonia—Bd. Educ., High School, will not build 2 story, basement, brick, steel high school, Christie Heights. $566,000. Project abandoned. Hacker & Hacker, 201 Main St., Fort Lee, archts. Noted June 4.

N. J., Little Ferry — Bd. Educ., J. Cronin, pres., new sketches by Hacker & Hacker, 201 Main St., Fort Lee, and bids probably in September general contract 2 story, basement, brick, steel school. $150,000. Noted June 4.

N. J., Montclair — State Bd. Educ., State House Annex, Trenton, revised sketches by Guilbert & Betelle, 20 Branford Pl., Newark, 2 story, basement, brick, steel, rein.-con. school addition, Montclair Normal School grounds. $300,000. Noted Apr. 23.

N. Y., Brooklyn—Bd. Educ., 500 Park Ave., New York, sketches by W. C. Martin, Flatbush Ave. extension and Concord St., P. S. 50, Driggs Ave. and 3rd St. $350,000.

N. Y., Brooklyn—Bd. Educ., 500 Park Ave., New York, plans by W. C. Martin, Flatbush Ave. extension and Concord St., P. S. 201, 12th Ave. and 80th St. $300,000.

N. Y., Chaumont—School Bd., G. P. Tuttle, pres., grade and high school. $150,000.

N. Y., Geneseo—Bd. Educ. plans by R. Sherlock, 156 East 46th St., New York, high school. $275,000. Noted May 21.

N. Y., New York—Bd. Educ., 500 Park Ave., New York, plans by W. C. Martin, archt., Flatbush Ave. extension and Concord St., Brooklyn, addition to P. S. 2, 3rd Ave. and 169th St. $350,000.

N. Y., New York—Bd. Educ., 500 Park Ave., plans by W. C. Martin, Flatbush Ave. extension and Concord St., Brooklyn, addition to P. S. 19, Katona Ave., Bronx Boro. $100,000.

N. Y., New York — Columbia University, Bway. and 116th St., 5 story, 170 x 260 ft. library. $1,000,000. **Maturity about January.** J. G. Rogers, 154 East 46th St., archt. Noted May 21.

N. Y., New York — New York University, Washington Sq., library, at Washington Sq. $5,000,000. **Maturity in fall 1932 or later.** J. G. Rogers, 154 East 46th St., archt. Noted Jan. 8.

N. Y., New York—Bd. Educ., 500 Park Ave., plans by W. C. Martin, Flatbush Ave. extension and Concord St., Brooklyn, addition to P. S. 86, Reservoir Ave. and West 195th St. $300,000.

N. Y., Utica—St. Francis de Sales Church, D. Doody, pastor, plans by C. Keihm, 27 Gardner Bldg., 4 story, brick, limestone school. $250,000.

N. Y., Wolcott—Bd. School Trustees school, 1,000 seating capacity. $450,000.

Pa., Munhall—Bd. Educ., L. J. Holman, pres., 700 11th Ave., plans by A. G. Wickerham, 135 East 8th St., Homestead, and soon takes bids 3 story, brick, steel elementary and junior high school, Woodlawn Ave. and Charles St. $200,000.

Tex., Austin — University of Texas, Bd. Regents, c/o J. W. Calhoun, comptroller, plans by Herbert M. Greer, La Roche & Dahl, 307 Constr. Industrial Bldg., Dallas, library building, $1,000,000; Union group, incl. students activities building, cafeteria and lunchroom, small auditorium, $750,000; physics building, $450,000; home economics building, $350,000; architecture building, $300,000; men's dormitory, $200,000; library and home economics buildings will probably be erected first, all on campus.

BIDS ASKED

Ark., Jonesboro—July 14 (extended date), by Bd. Trustees Agricultural & Mechanical College, 4 story, light buff face brick administration building, $350,000. E. W. Mann, Cotton Exch. Bldg., Memphis, Tenn., and Petter & McInich, Pyramid Life Insurance Bldg., Little Rock, Ark., archts. Noted June 11.

Del., Milford—Delaware School Foundation, Du Pont Bldg., Wilmington, bids about July 1, 2 story, basement, brick, steel addition to grade and high school, plain found. $150,000. Guilbert & Betelle, 20 Branford Pl., Newark, N. J., archts.

Fla., Tallahassee—July 10, by State Bd. Control, P. K. Yonge, chn., at El Verano Hotel, West Palm Beach, training school for teachers at Florida A. and M. College for Negroes, Tallahassee. R. Weaver, 204 Peabody Hall, Gainesville, archt. to Bd. Control.

Ind., English Lake—School Comrs., taking bids brick, steel township school. $150,000. A. E. Turner, 116 North East St., Crown Point, archt.

Mass., Cambridge — Harvard University, A. Lawrence, pres., c/o Coolidge, Shepley, Bulfinch & Abbott, archts., Ames Bldg., Boston, taking bids 3 story, basement, brick dormitory, plain found., Old Russell Hall site. $150,000 or more.

Mass., Hamilton—July 7, by Town, J. Lamson, chn. Building Comn., (from selected list bidders), 2 story, basement, 120 x 125 ft., brick, stone high school, Union St. $150,000. C. B. Loring, 7 Water St., Boston, archt.

Mass., Pittsfield—Roman Catholic Dioceses, c/o J. W. Donohue, archt., 1200 Main St., Springfield, taking bids found. for 3 story, basement, 110 x 285 ft., brick, cast stone, high school, Linden St. $350,000.

Mich, Otsego—Billingham & Cobb, archts., 211 Woodward Ave., Kalamazoo taking subbids, 2 story, basement, brick, steel, concrete school, for Bd Educ. $155,000.

N. J., Mahwah — July 9, by Bd. Educ., Hohokus Twp., E. T. Bennet, dist. clk., School House, 1 story, basement, 80 x 140 ft. school. $150,000. A. J. Rogers & J. Guptill, 55 West 42nd St., New York, archts. Noted June 11.

N. J., Paterson—State Bd. Educ., State House, Trenton, bids about Sept. 15, general contract 3 story, basement, brick, steel state normal school, Almshouse site, $400,000. Guilbert & Betelle, 20 Branford Pl., Newark, archts. Noted Apr. 16.

N. J., Rutherford—T. J. Folks, archt., 488 East 33rd St., Paterson, bids about Aug. 1, general contract 2 story, basement, brick, steel school, Ames Ave. and Chestnut St. for St. Marys Roman Catholic Church, Rutherford. $200,000. Noted June 4.

N. J., West Orange — Bd. Educ., Northfield Ave., bids about Aug. 15, general contract, plumbing, heating, electrical work, Junior High School, 3 story, basement, brick, steel, rein.-con., Gilbert St. $550,000. Hacker & Hacker, 201 Main St., Fort Lee, archts. Noted June 25.

CONTRACTS AWARDED

Calif., Los Angeles—University of Southern California, 3551 University Ave., Memorial Library, 4 story, 170 x 245 ft., Class A rein.-con. Hoover St. to P. J. Walker Co., 117 West 9th St., $750,000. Noted Oct. 30.

Calif., Pasadena — California Institute of Technology, one 60 x 134 ft. and one 100 x 125 ft., both 3 story, basement, rein.-con., marble, tile geology laboratories, to Wurster Constr. Co., 307 Architects Bldg., Los Angeles, $500,000.

Del., Frederick—Delaware School Foundation, Du Pont Bldg., Wilmington, general contract 1 story, basement, brick, steel school, plain found., to P. Lange, 28 Yale Rd., Audubon, N. J.; plumbing and heating, to E. L. Jones Co., Dover; electrical work, to Arrow Electric Co., 5112 Whitby Ave., Phila., Pa. Est. $150,000.

Ind., Seymour—School Comrs., general contract Riley School, 6th and Bliss Sts., and Lincoln School, Brown and O'Brien Sts., both brick, steel, stone, to J. Colglazier & Son, Salem. Est. $150,000. Noted May 21.

Mass., Cambridge — Stone & Webster, Inc., constr. mgrs., 49 Federal St., superstructure 5 story, basement, 50 x 300 ft., brick, limestone, steel chemistry building, physics laboratory, plain found., to Scully Co., 238 Main St., for Massachusetts Institute of Technology, Charles River Rd. Est. $800,000. Noted June 11.

Mass., Everett—City, altering and constructing Adams School, 2 story, basement, brick, stone, plain found., to C. S. Helrich, 139 Bucknan St. $150,000. Noted May 14.

Mass., Fairhaven—Town, W. B. Gardner, chn. com., altering and constructing 2 story, basement, brick steel addition to Senior High School, plain found., Huttleston Ave., to Locke-Thomas Co., 456 Acushnet Ave., New Bedford. Est. $200,000. Former contract rescinded. Noted Dec. 11.

N. Y., Buffalo—Sisters of St. Joseph, 2 story, basement, 54 x 160 ft., brick school, dormitory for Deaf Mute Institution, 2253 Main St., Main and Florence Aves., to Linwood Constr. Co., 259 Delaware Ave., $140,000.

N. Y., East Aurora—Bd. Educ., Union Free School, Buffalo, altering and constructing addition to school, to Lowman Constr. Co., Elmira, $213,490.

Pa., Ardmore—Bd. Educ., Lower Merion Twp., general contract 3 story, basement, 212 x 220 ft., rein.-con., brick, steel administration building, plain found., to McCake Bros., Rock Hill Rd., Cynwyd, $442,000; electrical work, to Stewart Walters Electric Co., 37 South 69th St., Phila., $23,500; plumbing, to Bulman Bros., 5th and Cumberland Sts., Phila., $29,283; heating and ventilating, to Bowers Bros. Co., 2015 Sansom St., Phila., $46,864. Grand total $541,647.

Wis., Milwaukee—Bd. Educ., tile work for 16th Street School to Cafmeyer Bros., 318 Juneau Ave. $1,028, terrazzo, to Stark Mosaic & Tile Co., 2514 North Ave. $4,055, marble, to Breidster Marble Co., 500 7th St. $6,056, plaster, to Milwaukee Ornamental Plaster Co., 530 Galena St. $8,400, plumbing, to Wenzel & Henoch Co., 498 27th St. $11,248, heating, to Industrial Heating & Eng. Co., 490 Bway. $20,795, temperature control, to Natl. Regulator Co., 1007 Winnebago St. $3,171, electrical wiring and electrical fixtures, to Schultz & Fuhr, Erie St. $5,677 and $888 respectively; dust collecting system for Washington High School, to Reinke & Reinke, 518 Market St., $1,500; in North Division High School, to National Blow Pipe & Ventilating Co., 2016 Walnut St., $1,144; carpentry work for Capitol High School Stadium, to M. Mravik, 2360 North 28th St. $8,397, playfield and running track, to Kroening Constr. Co., 39th and Mitchell Sts. $18,888, plumbing and sewage, to O. A. Waskow, 2218 State St. $7,689. Grand total $98,936.

Theatres

PROPOSED WORK

Calif., Long Beach—Fox West Coast Theatres, Inc., 1609 West Washington St., Los Angeles, plans by S. C. Lee, archt. and engr., 2404 West 7th St., Los Angeles, complete remodeling, modernistic architecture, terra cotta theatre $150,000.

Calif., Los Angeles—Fox West Coast Theatres, Inc., 1609 West Washington St., plans by S. C. Lee, engr. and archt., 2404 West 7th St., 2 story, 130 x 300 ft., concrete, steel, tile, Spanish architecture, unusual plan arrangement, incl. autopark, Florence and Compton Sts. $250,000.

Mass., Brookline (br. Boston)—Paramount Publix Theatres, Paramount Bldg., New York, plans by G. L. and C. W. Rapp, Paramount Bldg., New York, theatre. To exceed $150,000. **Maturity indefinite.** Noted Mar. 19.

BIDS ASKED

Calif., Los Angeles—Charles G. Andrews Co. (agent), taking sub-bids 1 story, balcony, 82 x 155 ft., rein.-con., tile, sheet metal, steel theatre, store, incl. stage, talking equipment, special lighting, wrought iron, drinking fountains, 522 South Bway. $225,000. J. M. Cooper, 320 Rives-Strong Bldg., archt.

BANKS

PROPOSED WORK

Kan., Topeka—National Bank of Topeka, C. W. McKeen, pres., plans by T. W. Williamson & Co., 312 Farmers Natl. Bank Bldg., and K. M. Vitzthum & Co., assoc. archts., 1 La Salle St., Chicago, Ill., 12 story, basement, 75 x 115 ft., concrete, Indiana Bedford stone, steel, cantilever construction, set-back style bank, office, 6th St. and Kansas Ave.

N. Y., Dunkirk—Lakeshore Natl. Bank, soon lets contract 48 x 110 ft. bank, Central and 4th Sts. P. Mann, 494 Franklin St., assoc. archt. L. Cunnyngham, 7 Dey St., New York, archt.

CONTRACTS AWARDED

N. Y., New York—Bankers Trust Co., 14 Wall St., 30 story bank, office, 14 Wall St., to Thompson-Starrett Co., 250 Park Ave. Est $10,000,000. Contractor takes separate contract bids about Sept. 1.

OFFICES

PROPOSED WORK

Calif., Los Angeles—Legal Tower Ltd., 1st St. and Bway., plans by A. Curlett, 1012 Union Bank Bldg., 80 x 80 ft. steel, concrete office and store building, 1st St. and Bway. $2,000,000.

Kan., Topeka—Finance Building Corp., J. N. Leeper, pres., 111 East 21st St., plans by T. W. Williamson & Co., 312 Farmers Natl. Bank Bldg., 12 story, basement, 50 x 70 ft., concrete, brick, steel, marble, cut stone, 10th and Kansas Sts. $350,000. **Maturity indefinite.**

N. Y., Jamaica—Herriman Avenue Building Corp., c/o H. T. Jeffrey, archt., 90-50 Parsons Blvd., 10 story office, Herriman and Jamaica Aves. $300,000.

Que., Montreal—Canada General Electric Ltd., 941 Inspector St., plans by Ross & Macdonald, 1 Belmont St., and soon takes bids 7 story, stone, welded steel office, Beaver Hall Hill. $450,000. Noted Feb. 19.

CONTRACTS AWARDED

N. Y., New York — Thompson-Starrett, 250 Park Ave., excavation and found. for 48 story office and bank, to Thomas Crimmins Contg. Co., 734 Lexington Ave., New York, for Continental Realty Corp., 25 Broad St.; 7,000 tons structural steel, to Amer. Bridge Co., 71 Bway., New York. Noted June 4.

N. Y., Syracuse — Syracuse Lighting Co., South Warren St., 7 story, tower, 88 x 208 ft. brick, steel, concrete office, to J. D. Taylor Constr. Co., 115 South Salina St., $900,000 Contract awarded in May. Noted Apr. 16.

STORES

PROPOSED WORK

Mass., Pittsfield—England Bros., 89 North St., rejected bids May 25, 3 story, brick, steel top addition, North St. $150,000. **Project postponed.** G. E. Haynes, 29 George St., archt. Noted May 21.

BIDS ASKED

N. J., Caldwell—Owner, c/o E. R. Coe, archt., 136 Washington St., Paterson, bids about Aug. 1, general contract 2 story, basement, 60 x 125 ft., brick, steel store, office. $150,000. Noted June 18.

N. J., East Orange—E. C. Epple, archt., 17 Washington St., Newark, taking bids general contract 2 story, basement, 65 x 100 ft., brick, steel store, apartment, Dodd and Prospect Sts., for Owner, c/o architect. $150,000. Noted June 25.

N. J., Hackensack—Boundary Realty Co., S. Kraft, pres., 7 Prospect Ave., and L. H. Friedland, archt., 562 5th Ave., New York, taking bids on revised plans general contract 3 story, basement, brick, steel, store, apartment, Essex St. and Prospect Ave. $150,000. Noted May 14.

N. J., Paterson—J. Bellomo, archt., 6 Park Ave., bids about July 15 (from selected list of bidders), general contract 2 story, basement, 30 x 125 ft., brick, steel store, office, storage and comfort station, Island Market Sect., for Island Market Corp., P. Alfano, in charge, 7 Bank St. $150,000. Noted June 18.

CONTRACTS AWARDED

Ia., Cedar Rapids — C. Denecke, 1744 2nd Ave. S. E., and Newmans Mercantile Co., 117 South 2nd St., 3 story, basement, rein.-con., Bedford stone store, 2nd Ave. and 2nd St. S. E., to O. F. Paulson Constr. Co., Iowa Theatre Bldg., Cedar Rapids. Est. $150,000.

PUBLIC

PROPOSED WORK

N. J., Jersey City—HALL of RECORDS—Bd. Freeholders Hudson Co., 16 story, basement, 200 x225 ft., brick, steel, adjoining court house. $2,000,000. **Maturity in September.** J. T. Rowland, 30 Veterans Sq., archt. Noted June 11.

N. Y., New York—ART MUSEUM—Park Bd., W. R. Herrick, pres., Park Dpt., Arsenal Bldg., Central Park, bids late in August, art museum, for Metropolitan Museum of Art, 5th Ave. from 80th to 84th Sts. $3,350,000. J. R. Pope, 542 5th Ave., archt. E. E. Seeley, 101 Park Ave., structural engr. Tenny & Ohmes, 101 Park Ave., mechanical engrs. Noted June 4.

N. Y., Saratoga Springs — BATHS, etc. — Saratoga Springs Comn. plans by J. H. Freedlander, 681 5th Ave., New York, baths, spa remodeling baths, constructing drinking hall, $2,500,000. A. F. Brinckerhoff, 101 Park Ave., New York, landscape archt. Noted Mar. 12.

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Public (Continued)

Tex., Austin—OFFICE—State, c/o Bd. Control, plan office building. State Grounds. $500,000 appropriation approved.

BIDS ASKED

Mass., Newton—CITY HALL—July 15, by City, S. Weeks, mayor, brick, limestone, steel memorial city hall, Commonwealth Ave., Walnut and Homer Sts., $1,000,000. Allen & Collens, 75 Newbury St., Boston, archts. Olmstead Bros., 99 Warren St., Brookline, landscape archts. Noted July 17.

N. J., Jersey City—ARMORY—July 20, by State Military Bd., Quartermaster Generals Office, Trenton, general contract 4 story, basement, 225 x 320 ft., brick, steel, rein.-con., Montgomery St., Jordon and Summit Aves., $400,000. J. O. Hunt, Hunt Bldg., Trenton, archt. H. A. Kelly, 921 Bergen Ave., Jersey City, assoc. archt. Noted May 21.

UNCLASSIFIED

PROPOSED WORK

Ia., Des Moines—EXCHANGE—Northwestern Bell Telephone Co., H. G. Conger, mgr., 3404 Iola St., plans by J. Normile, 203 Hubbell Bldg., 2 story, basement, 65 x 80 ft., concrete, brick, incl. automatic switching equipment, 4201 Kingman Blvd. $1,125,000.

N. Y., Ticonderoga—EXCHANGE—New York Telephone Co., soon lets general contract telephone exchange. $150,000. Bids in. Voorhees, Gmelin & Walker, 101 Park Ave., New York, archts.

N. Y., Yonkers—HOME—New York Guild for Jewish Blind, 200 West 72nd St., New York, home for blind. $500,000. **Maturity about November, 1932.** Noted Jan. 22.

Pa., Phila.—TEMPLE of MUSIC and DRAMA—Philadelphia Arts Assn., c/o Curtis Institute, 1726 Locust St., plans by Voorhees, Gmelin & Walker, 101 Park Ave., New York, 1 story, basement, 3 auditoriums, 19th and Race Sts.

BIDS ASKED

Calif., Los Angeles—LABORATORY—H. R. Kelley, Architects Bldg., taking bids part 1 and 2 story, 55 x 140 ft., brick, Alvarado and Valley Sts., for Maas Chemical Co., 308 East 8th St.

Calif., San Diego—STATION—July 13, by City Council, 2 story, 100 x 1,000 ft. rein.-con. freight and passenger station, to land passengers from vessels to second floor to depot, Broadway Pier. $174,000.

CONTRACTS AWARDED

Calif., Los Angeles—SALES—E. L. Cord, Wilshire Blvd. and Mariposa Ave., structural steel contract 5 story, basement, 140 x 200 ft., steel, concrete, terrazzo auto sales and service, plain found., to McClintic-Marshall Co., Pacific Southwest Bldg. Est. $250,000. Lynch-Cannon Eng. Co., 1027 Chapman Bldg., engrs. A. C. Martin, Higgins Bldg., archt. Noted Apr. 30.

Mo., Kansas City—MAUSOLEUM—Rose Hill Cemetery, 79th and Troots Ave., 1 story mausoleum, to Swenson Constr. Co., Schubert Theatre Bldg., Kansas City. Est. $200,000. Noted Jan. 15.

N. J., Seabright—EXCHANGE—New Jersey Bell Telephone Co., 540 Broad St., general contract 2 story, basement, brick, steel, to C. R. Davidson, Atlantic St., Keyport. Est. $150,000. Noted June 4.

O., Cleveland—EXCHANGE—Ohio Bell Telephone Co., 750 Huron Rd., 2 story, 80 x 92 ft., brick, steel, concrete addition, 19223 St. Clair Ave. to W. J. Schirmer Co., 1720 Euclid Ave. Est. $150,000. Noted Dec. 18.

Industrial Buildings

FACTORIES AND MILLS

PROPOSED WORK

Ariz., Douglass — GAS PLANT — Arizona Edison Co., W. C. Hornberger, vice-pres. and genl. mgr., Phoenix, converting artificial gas plant and system to use natural gas. $75,000.

Calif., Los Angeles—DAIRY—Valley Dairy Co., 548 Clayton, Los Angeles, plans by R. T. Cooper Co., Western-Pacific Bldg., 2 story, 76 x 78 ft. and 65 x 200 ft., Class A rein.-con., Fletcher St.

Calif., Oakland—DAIRY—E. G. Shuey, 2738 Benevenue Ave., Berkeley, plans by G. Officer, Hotel Clairmont, Berkeley, 1 story, brick, McAuley St. and Telegraph Ave. $40,000, incl. equipment.

Mich., Detroit — LABORATORIES — Ethyl Gasoline Corp., 135 East 42nd St., New York, soon lets general contract additons to engineering and gas testing laboratories. To exceed $40,000.

N. Y., Flushing—KILN SHED—Empire State Pipe Corp., 158-38 33rd Ave., 1 story, 82 x 100 ft. kiln shed and 1 story, 20 x 177 ft. work shed.

N. J., Hawthorne—ICE PLANT—Sands Bros., 1099 Goffle Rd., will not rebuild 2 story, basement, brick, steel, Goffle and Rock Rds. $40,000. Project abandoned. Noted June 4.

N. Y., Brooklyn—RUBBER FACTORY—Rand Rubber Co., Halsey St. and Sumner Ave., soon lets contract altering 3 story, Halsey St. and Sumner Ave. $40,000. M. Marlo, 200 Beverly Rd., archt. Noted June 18.

N. Y., New York — LAUNDRY — Champion Coat & Apron Supply Co., 312 East 96th St., sketches by M. Winston, 470 7th Ave., 3 story, 50 x 100 ft. linen laundry, 314 East 96th St. $75,000.

N. Y., New York—FACTORY—P. J. Kennedy & Sons, 44 Barclay St., plans by A. J. Barzaghi, 13 East 37th St., altering manufacturing and storage building, incl. elevator, plumbing, heating, 12 Barclay St. $40,000.

O., Massillon—STEEL STRIPPING PLANT—Republic Steel Corp., Youngstown, soon takes bids steel strip plant extension to manufacture stainless steel, at Central Alloy Div. $300,000. Private plans.

Pa., Scranton — RAYON MANUFACTURING PLANT—Princeton Rayons, 150 Madison Ave., New York, bids about January on general contract rayon plant. $300,000.

Wash., Seattle—FACTORY—Wire Rope Mfg. & Equipment Co., subsidiary Puget Sound Mchy. Depot, 322 1st Ave. S, rebuilding steel plant for special rope making equipment, recently destroyed by fire. $150,000 loss.

Sask., Veregin—FLOUR MILL—Doukhobor Community flour mill. $75,000.

BIDS ASKED

Ind., Evansville—FACTORY—Sunbeam Electrical Mfg. Co., West Morgan St., taking bids rein.-con., brick, steel addition. $40,000. Private plans.

Mo., St. Louis—NEWSPAPER PLANT—Midwest Industrial Development, c/o Illinois Terminal R.R. Co., A. P. Titus, vice-pres., 314 Shell Bldg., bids about July 10, superstructure 5 story, basement, sub-basement, rein.-con., brick, stone, High, 12th and Morgan Sts. F. D. Chase, Inc., 720 Michigan Ave., Chicago, Ill., archt. Star Chronicle Publishing Co., E. Roberts, publisher, 12th and Olive Sts., lessee. Noted Apr. 16.

N. J., Carteret—PLANT—C. Sheridan, engr., 114 Lincoln Ave., taking bids general and separate contracts plant, for American Mineral Spirits Co., 205 East 42nd St., New York. $40,000. Noted June 4.

N. Y., New York—BAKERY—See "Contracts Awarded."

Texas — CITRUS PACKING PLANTS — J. Shary, Mission, taking bids 1 story, 100 x 160 ft., concrete, ironclad or brick packing plant, new equipment, at San Carlos, 5 mi. east of Edinburg, $75,000; 1 story, 100 x 140 ft., concrete frame plant, metal siding, platforms, at Harlingen, $75,000. Private plans. Noted June 4.

CONTRACTS AWARDED

Calif., Oakland—LAUNDRY—Miller & Warnecke, archts., Financial Center Bldg., 1 story, mezzanine, 175 x 280 ft., brick, steel, to F. C. Stolte, 3443 Laguna St., for Oakland Laundry Co., 730 29th St., $62,500 incl. equipment. Noted June 19.

Mass., Cambridge—FACTORY—F. L. Daggett, 408 Main St., altering and constructing 5 story, basement, brick, steel addition, plain found., 18 Ames St., to Wm. M. Bailey & Co., 88 Broad St., Boston. Est. $40,000.

Mass., Quincy — DAIRY — White Bros., 50 Brooks St., 1 story, brick, concrete, steel addition, plain found., to Clark & Smith, 1372 Hancock St. Est. $40,000. Noted June 18.

Mass., Stoughton — FACTORY — Panther Rubber Co., 56 Monks St., 2 story, 60 x 84 ft. and 50 x 160 ft., brick, timber, Monk St. $40,000. Owner builds. Schein & Levine, 333 Washington St., Boston, archts.

Mo., St. Louis—CARTON FACTORY—Doane Carton Co., 912 North Market St., concrete work for 1 story, basement, 60 x 80 ft., brick, concrete, steel addition, 912 North Market St., to A. L. Rascher Constr. Co., 4108 Clayton Ave. Est. $50,000.

N. Y., Buffalo—BAKERY—LeVeque Constr. Co., 1314 Edgehill Rd., Columbus, O., 80 x 120 ft., rein.-con., Mertle and Hamburg Aves. Owner builds. Atlantic & Pacific Tea Co., 420 Lexington Ave., New York, lessee.

N. Y., Maspeth—FACTORY—Circle Flexible Co., 24-44 Woodward Ave., 1 story, 94 x 100 ft. conduit factory, to H. Rosen, 242 Sumner Ave., Brooklyn. Est. $40,000. Noted June 18.

N. Y., New York—BAKERY—Eight Hundred Forty Barry Street Corp., 704 East 133rd St., 2 story, basement, brick, steel, Barry St. and Burnett Pl., separate contracts and day labor. P. J. Murray, 14 West 45th St., archt.

N. Y., Ridgewood—FACTORY—Stahl Meyer Co., Wyckoff Ave. and Cody St., 1 story, basement, 116 x 118 ft. addition, to W. E. Anderson, 885 Flatbush Ave., Brooklyn. Est. $45,000. Noted June 18.

Pa., Phila.—MANUFACTURING PLANT—Boyertown Burial Case Co., E. L. Mory, pres., 1211 Arch St., 3 story, basement, 34 x 112 ft., rein.-con., brick, steel, plain found., Florist and Juniper Sts., to G. H. Heebner, 1231 Vine St.

GARAGES

PROPOSED WORK

Mass., Barnstable — E. H. Corson, 6th and Elm Sts., New Bedford, plans by L. LaBrode, 888 Purchase St., New Bedford, 1 story, basement, 65 x 100 ft. and ell, brick, stone, rein.-con., steel service station, showroom, concrete found., Barnstable Rd. and Louis St. $50,000.

Mass., Pittsfield—Pittsfield Electric Co., C. E. Merrill, Pearl St., 3 story, brick, concrete service, office and garage building, Pearl and Renne Ave. To exceed $75,000. Private plans.

N. J., East Orange—Rocco Realty Co., M. Rousek, mgr., 507 Main St., will not build 2 story, basement, brick, steel garage, Main St. and North Arlington Ave. $150,000. Project abandoned. Noted June 4.

N. J., Newark—J. Geanet, 251 Hillside Ave., brick, steel auto laundry shop, on 115 x 235 ft. site, 257 Elizabeth Ave. $40,000. Maturity probably soon. Acme Auto Laundry, 259 Elizabeth Ave., lessee and builder.

N. Y., Brooklyn—H. S. Burnham, 215 West 75th St., bids in November or later general and separate contracts 100 x 160 ft. service garage, Gravesend Ave. and Avenue J. $40,000. W. Shary, 22 East 17th St., New York, archt. Noted June 18.

N. Y., Long Island City—Kalbirt Realty Co., 26 Court St., Brooklyn, plans by P. Freshman, 50 Court St., service garage, 148th St. and Archer Ave. $40,000.

N. Y., New York—Eight Hundred Forty Barry Street Corp., 704 East 133rd St., service garage, Barry St. and Burnet Pl. To exceed $40,000. P. J. Murray, 14 West 45th St., archt. Project indefinitely in abeyance. Noted May 14.

BIDS ASKED

N. J., Newark—See "Contracts Awarded."

N. Y., Jamaica—See "Contracts Awarded."

CONTRACTS AWARDED

Mass., Lowell—Whitehead Realty Corp., 44 School St., Boston, 1 and 2 story, 75 x 230 ft., brick, steel garage and storage, concrete found., Howe St., to Capobianco Constr. Co., 44 School St., Boston. Est. $75,000.

Mo., Sikeston — Missouri State Hy. Comn., Jefferson City, 2 story, concrete, brick garage and division office, to J. Epple Constr. Co., Columbia, $62,500. This corrects report in June 25 issue.

N. J., Newark—J. Padovano, 31 Delancy St., 1 story, basement, brick, steel public garage, 50-68 Malvern St., separate contracts. $150,000. H. W. Castor, 1101 Stephen Girard Bldg., Phila., Pa., archt.

N. Y., Jamaica — P. Fantino, 169-19 107th Ave., Jamaica, 1 story, 87 x 116 ft., brick, steel service garage, Merrick Rd. and 107th Ave., separate contracts. $40,000. E. Gutman, c/o owner, archt. Noted June 18.

O., Shaker Heights (br. Cleveland) — City, E. P. Rudolph,clk., 1 story, 60 x 140 x 190 ft., brick, steel garage, work shop, Harvard Rd., to R. Hansen Constr. Co., 9535 Sandusky Ave., Cleveland, $44,500.

SHOPS AND FOUNDRIES

PROPOSED WORK

N. Y., Brooklyn—SHOP—Brooklyn Institute of Arts & Sciences, Academy of Music Bldg., Lafayette St., plans by McKim, Mead & White, 101 Park Ave., New York, shop, Eastern Parkway and Washington Ave. $45,000.

N. Y., New York—SHOP—Robert Wolff & Co., 627 East 18th St., rebuilding shop for manufacturing wooden novelties, destroyed by fire, 627 East 18th St. or other location. To exceed $40,000. **Maturity indefinite.**

Tex., Amarillo—SHOPS—See "Airports."

POWER PLANTS

PROPOSED WORK

Mass., Palmer — Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, sketches heating plant at Monson State Hospital. $300,000. E. C. Brown Co., 77 Summer St., Boston, engrs.

N. J., Perth Amboy—Bd. City Comrs., City Hall, will not build 2 story, basement, brick, steel addition to electric light plant. $40,000 or more. Project abandoned. Noted Mar. 3.

Ont., Ottawa—Ottawa Light, Heat & Power Co., J. Bronson, developing 3,500 additional hp. at Plant 4 and extensions to gas plant. $1,000,000.

BIDS ASKED

S. D., Aberdeen—July 10, by State, J. Berg, engr., Pierre, boiler house, central heating plant, Northern State Normal and Industrial School. $100,000. G. Fossum, Aberdeen, archt.

WAREHOUSES

PROPOSED WORK

N. Y., New York—Kay Moving Serv., 2464 Amsterdam Ave., bids in fall, general contract storage and warehouse, 2468 Amsterdam Ave. $150,000. G. S. Kingsley, 103 East 125th St., archt.

N. Y., New York—Randick Realty Corp., L. Koch, pres., 206 Lexington Ave., storage and stores, 649 Lexington Ave., $150,000. Project in abeyance. B. H. Whinston, 6 East 46th St., archt. Noted June 4.

Pa., Meadville—Sterling Oil Co., R. S. Newton, in charge, Emlenton, soon takes bids 1 story, 30 x 33 x 160 ft., concrete block warehouse and bulk plant, incl. four 65 to 70 gal. gas. tanks and three 12 to 15 gal. oil tanks, railroad siding. Private plans.

CONTRACTS AWARDED

Mo., St. Louis—Midwest Industrial Development Co., subsidiary Illinois Terminal R.R., A. P. Titus, vice-pres., 1221 Locust St., superstructure 17 story, basement, sub-basement, rein.-con., brick, steel, stone, terminal, warehouse, office, High St. from Morgan to Lucas Aves., to Selden-Breck Constr. Co., Fullerton Bldg., $1,000,000. Total $5,000,000. Noted Aug. 14, under "Buildings—Unclassified."

N. Y., Buffalo—Loblaw Groceterias, Inc., 168 Chandler St., general contract 4 story, 225 x 300 ft., brick, rein.-con. warehouse, Bailey Ave. and Clinton St., to J. W. Cowper Co., Niagara Sq., $500,000. Found. started.

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